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THE REBUILDING OF THE CAMPANILE OF ST. MARK'S AT VENICE.

The Campanile of St. Mark's, at Venice, was, up to the time of its collapse on July 14, 1902, one of the most interesting of the landmarks of Europe, not only on account of its historic association, but because of the rare combination of extraordinary dimensions and advanced age. It had stood through many centuries as a monument to the skill of its constructor and the art of its designer. The dignity and grace of its lines and proportions have been imitated in many of our New-World structures, notably in the tower of the Metropolitan Life Building, in New York City, which is remarkably like its prototype, though overtopping it by nearly 400 ft. It was with much regret that the news of the collapse of this ancient tower was received, and with a like amount of pleasure was welcomed the news that the city of Venice had undertaken the reconstruction.

This reconstruction was ordered by the municipal council of the city to be carried out by a committee of distinguished Italian engineers and architects, who had but one instruction: to rebuild the Campanile *dov'era e com'era*, "where it was and as it was." With this instruction the committee started an investigation of the original construction and material and the design of the new tower. This work has taken a long time, partly from lack of funds and partly from discussions as to methods, but the reconstruction is now in progress and the finish is in sight. This rebuilding of a tower after precisely the same external design and of the same or similar material to one first erected many centuries before is a problem of great interest to the engineer, even though he will probably never be called to a similar task. In "Le Genie Civil" for July 4, 1908, M. P. Raulin has an extensive account of the work from which much of the material for this article has been taken.

St. Mark's Place, where the Campanile is located, has been the site of some sort of a tower for fourteen centuries. The first tower, a portion of the extensive walled fortifications of the town, was erected some time in the sixth century of the present era, and stood until the beginning of the ninth century, when it was raised and its foundations strengthened in the general rebuilding of the fortifications. Up to this time the shaft had been used merely as an observation tower, but in 888, on the base of the old structure, the first Campanile, or bell-tower, was built. This remained intact until 1510, when an earthquake so disturbed the masonry that it became necessary to rebuild the shaft above the second line of windows. About this time the architectural features of the building as it stood in 1902 were added. The Campanile that fell then was close onto 400 years old, and the foundations upon which it rested had been in place at least a thousand years.

It collapsed without warning and the destruction was so complete that the place of the first failure or the manner of the fall could not be determined.

The Campanile, as it was known to the modern world, was square, about 45 ft. on a side, and 321 ft. high, the top 90 ft. of which was a pyramidal peak. Immediately below this peak was an open loggia in which hung the bells which gave the building its reason of being. It was built of brick, in rather thin walls, pierced at intervals with small windows and ornamented with stone trimmings. The interior served only as the staircase to ascend to the bells and the lookout. The foundations, of heavy solid rubble masonry, were founded on short oak piles of great age. Owing to the numerous earthquake shocks it had experienced in the ten centuries of its life, the Campanile had acquired a tilt in one direction of about 1:125, so that the top was nearly 3 ft. out of plumb. This inclination had, however, been of such long duration that the footings had compressed unequally, so they safely bore the eccentric load through the many centuries. Still, the inclination probably had some part in the cause of the latest collapse, though the reason behind this fall has not been satisfactorily determined, aside from the fact that numerous ill-advised openings were cut in the lower walls to make light and give air. At any rate, the fall of a structure which has stood through many centuries, without any known direct causative influence, must be the result of a gradual decay of the material. It is possible that the extremely moist atmosphere of Venice, saturated with the salt air, may have had some deteriorating effect on the mortar between the stone and brick or even upon the masonry itself.

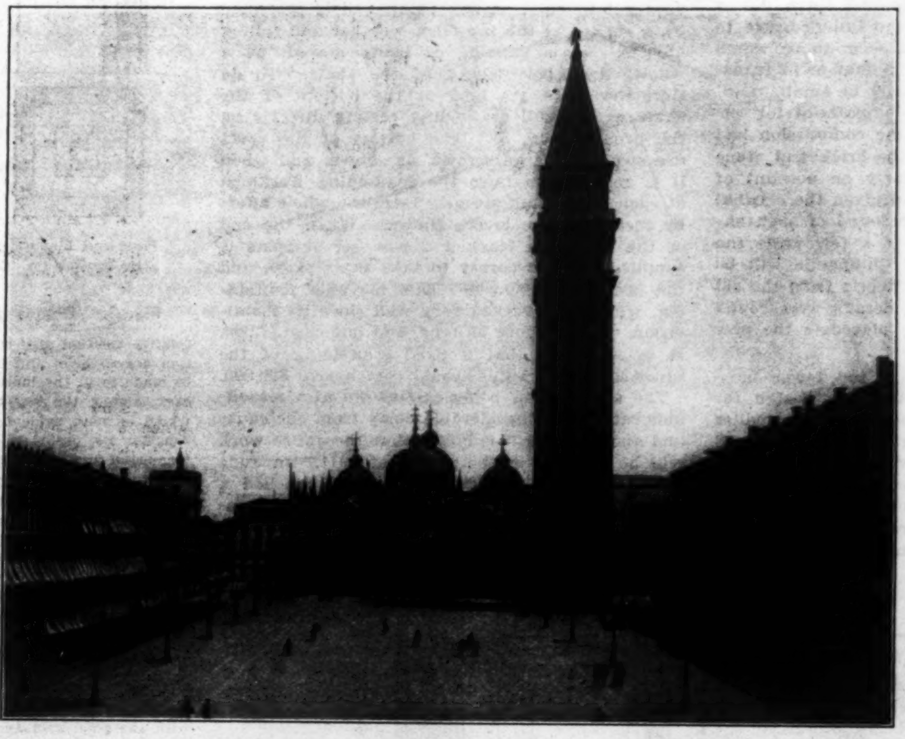

FIG. 1. THE CAMPANILE OF ST. MARK'S AT VENICE AS IT WAS BEFORE THE COLLAPSE OF 1902.

RECONSTRUCTION.—The first step in the reconstruction, after the investigation of the debris and the foundations, was the construction of new footings. Although the new tower was not expected to be heavier than the old, it was decided, for safety, greatly to enlarge the footings by driving about 4,000 extra piles, around the heads of which concrete was deposited. These were disposed around the perimeter of the base at the points of greatest pressure (Fig. 2). Some trouble was at first experienced with piles penetrating the solid strata into water-bearing planes, but the great number of new piles driven were accounted strong enough to bear the load. Upon these piles a crossed platform of timbers was laid and the masonry started therefrom. The interior original rubble foundation was left intact, but around the edges it was replaced by cut stone, as shown in Fig. 2. This foundation work alone cost over $50,000.

As was noted above, the endeavor throughout the new design has been to produce a facsimile of the old Campanile, but this attempt is only carried as far as appearance; the interior construction is in more modern style. The brick and stone facing are as close reproductions in shape, size and texture as could be made from the material now available and the knowledge of the old building as determined by personal recollection, an inspection of the debris and study of the available photographs and drawings. The interior, which was a masonry wall, some feet inside of the outer wall, cut with arched openings and carrying the staircase, is replaced by a concrete construction of arches and beams, which also carry the staircase (Fig. 4). The pyramidal portion at the top, instead of being entirely self-supported from the outside walls, is braced to interior concrete columns, which continue straight up from the line of the above-mentioned interior wall. In the bracing of this upper portion, particularly around the loggia floor, structural steel is to be used in the place of stone in the ancient structure, and here also the interior section is to be changed from circular to square.

Special attention is being paid to the founding of the new bells, a work which is being carried out under the direction of a committee of the leading musicians of Italy. In the placing of these, the supports are made much more staunch than in the old tower, so as to avoid the vibrations in the tower, due to their ringing. A rather peculiar construction, the reason for which is not altogether clear, has been designed to support the large statue, 17 ft. high, which surmounts the tower. The base of the statue is to be set in a hemispherical bowl and separated therefrom by ball bearings; then a large counterweight is to be hung from the base through the bearings into the tower, so that, under wind pressure, the statue will sway gently back and forth like a pendulum and not transmit the full pressure to the structure. This does not seem to be worth the trouble and cost, for the reduction in transmitted pressure must necessarily be small.

In the search for a suitable material for the external faces of the tower, the commission had some trouble in duplicating the brick and stone of the old building, particularly on account of the texture that great age had given the original face. However, material was found of such nature that it is thought that in a few years the likeness of the new and old Campanile will be nearly perfect. Then, in the debris from the old tower many of the masonry details were found intact, so that they could be placed in the new work just as they were.

STRESSES.—The stresses in the tower have been materially reduced in the new design for three reasons: (1) The masonry is of smaller dimensions, and therefore lighter; (2) there will be no inclination in the new tower, thus doing away with the increased pressure due to eccentric loading; and (3) the bell connections are so arranged as to reduce their transmitted effect on the masonry. In the accompanying table are given the stresses on that section of the tower having the maximum pressure, in both the old and new construction.

PRESSURE ON MASONRY IN LBS. PER SQ. IN. ON SIMILAR HORIZONTAL SECTIONS OF THE [illegible] NEW CAMPANILE AT VENICE.

	Due to Direct Load.	Due to Inclination		Due to Wind		Due to Bells		T[illegible]
		Comp.	Tens.	Comp.	Tens.	Comp.	Tens.	Max.
Old	190	16	16	63	63	11	11	270
New	121	..	..	55	55	8	8	184

In the new footings the maximum pressure on the piled earth is 4.3 tons per sq. ft., as against a maximum of 10 tons per sq. ft. in the old.

SCAFFOLDING.—Up to a height of 38 ft. the masonry was erected by means of ordinary scaffolding similar to that generally employed in such work. Above that height recourse was had to a system specially studied out by one of the engineers of the commission for reconstruction. The conditions imposed on the new system were, first, to assure the security of the workmen; second, to simplify the raising of the scaffolding and to reduce to a minimum the stoppages of work during this raising; third, to leave no permanent mark of the timbers on the walls; fourth, to provide a roof to protect the workmen during bad weather; fifth, to protect the walls during the construction; and, sixth, not to have too high a price. The scaffolding answering these conditions is shown in detail in Fig. 3 and in the view in Fig. 5. It consists essentially of four vertical posts placed near the four corners of the tower, and braced at intervals through the small windows, and of a movable platform supported by these four posts. The posts are formed of double channels, placed back to back. This scaffolding does not harm the masonry in any way, for it does not touch it at any point, and is protected by a shelter at the top from weather and falling objects. It is capable of being moved, as a whole, the whole length of the shaft. To do this, the posts are held at the bottom of the shaft by a small scaffolding resting directly on the ground (Fig. 3). The bottom of the posts are swung to large screws, as shown, and when it is required to raise the scaffolding workmen at each post simultaneously raise the whole affair by means of the levers shown. When the end of the screws is reached a new set of posts is supplied at each corner to take their place, and the operation renewed. This movable scaffolding, which has worked very well since its installation, weighs about 55 tons, and has cost $7,000. It is estimated that a fixed scaffolding of the same structural value would cost nearly $20,000.

The work is now being carried out at a reasonable rate, after considerable delay from one cause and another and it is hoped that the entire work will be finished in the spring of 1911. In June of this present year the tower had reached a height of 80 ft. above the ground, and was progressing at the rate of about eleven vertical feet per month. It is expected that the entire cost of reconstruction will be about $360,[illegible] of which is being borne by the city of V[illegible] although, after the collapse of 1902, it [illegible] proposed that the expense be met by an [illegible]national subscription.

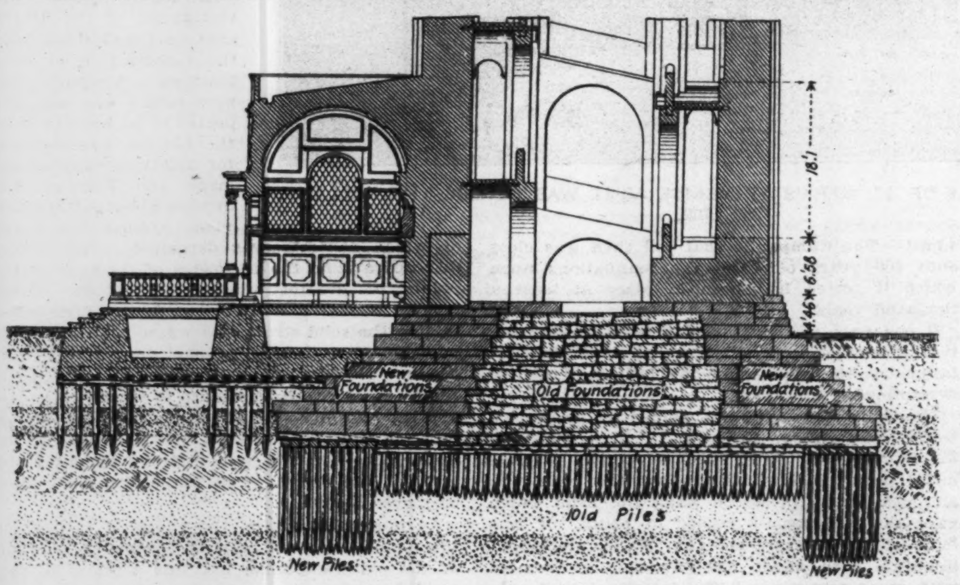

FIG. 2. VERTICAL SECTION THROUGH BASE OF TOWER, SHOWING NEW AND OLD FOOTINGS.

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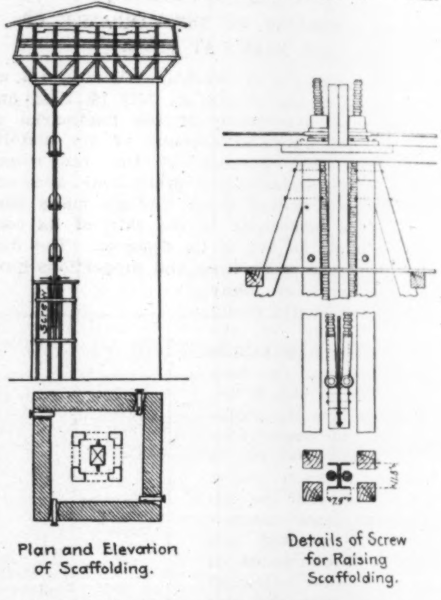
RAILWAY MAINTENANCE-OF-WAY ORGANIZATION.*

By H. R. SAFFORD.†

There are great differences in opinion between leading railway men as to the best kind of organization in any department. Even with railways of the same size and with almost the same physical and traffic conditions, there are greatly different organizations in effect. In a general way, these are successful. Differences in the training and capacity of individuals occupying the same relative position may require different forms of organization below them, and the organization sometimes has to be made to fit the individual. There is a tendency, however, among the larger railways to a uniform method, which is more evident in the transportation and traffic departments, probably, than in the mechanical and maintenance-of-way departments.



Plan and Elevation of Scaffolding.

Details of Screw for Raising Scaffolding.

Fig. 3. Details of the Movable Scaffolding.

The organization on a small railway of 200 to 300 miles must be different from that of a large system. But this discussion can be confined to the large railway system of from 2,000 to 10,000 miles and with vastly differing physical conditions.

In the organization of a railway in operation, there are three principal departments, and these departments are found in all railway organizations, large or small. They are as follows: (1) The financial and accounting department, whose function is indicated by its name. (2) The traffic department, whose function is to develop and secure all classes of traffic both passenger and freight. (3) The operating department, which is charged with the responsibility of handling and transporting the traffic after it has been secured. Its duties are:

(1) To provide and maintain the roadbed and structures.

(2) To care for the entire physical property of the railway, including right-of-way franchises and other rights of occupation.

(3) To provide the telegraph and signal service for the safe operation of trains.

(4) To provide and maintain the motive-power machinery and rolling stock.

(5) To provide and maintain the organization for handling the freight and passenger traffic and operating trains.

The operating department, in itself, has three principal departments: (1) The maintenance-of-way department; (2) the motive power department; (3) the transportation department. The maintenance-of-way department has the following responsibility:

(1) The care and maintenance of all tracks and structures of the lines of the railway in operation. It does

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*Abstract of a paper in the "Purdue Engineering Review," Purdue University, Lafayette, Ind.

†Chief Engineer of Maintenance-of-Way, Illinois Central R. R., Chicago.

MAINTENANCE OF WAY ORGANIZATION.

- Vice President { General Manager { Chief Engineer Maintenance of Way
  - General Supt. { Supt. of Division { Engineer Maint. of Way
    - Assistant Engineer { Instrumentmen, Rodman, Chainman
    - Track Supervisors { Section Foremen, Extra Gang Foremen
    - Supervisor of Bridges & Buildings { Building Foremen, Bridge Foremen
    - Water-works Foreman { Water-works Repairmen
  - Assistant to Chief Engineer of Maintenance-of-Way
  - Engineer of Bridges and Buildings...
    - Ass't Engineer of Bridges & Buildings
    - Sup't of Bridges...... { Floating Gang Foremen
    - Sup't of Buildings... { Building Inspectors, Extra Gang Building Foremen
    - Architect.............. { Architectural Draftsmen
    - Chief Draftsman...... { Bridge Draftsmen
    - Sup'r Fire Protection { Inspectors
  - Office Engineer { Assistant Engineer, Instrumentman, Rodman
  - Chief Draftsman { Map Draftsmen
  - Right-of-Way Engineer
  - General Foreman Water-works { Inspectors, Extra Gang Foremen
  - Chief Gardener { Assistant Chief Gardener
  - Chief Time Checker { Time Checkers
  - Supervisor of Scales { Scalemen
  - Chief Timber Inspector { Tie Inspectors, Timber Inspector, Treating Plant Foremen

not, however, generally assume charge of the construction of new lines.

(2) The care and maintenance of the water supply; including wells, reservoirs, power plants and pipe lines.

(3) The care and maintenance of all tracks and freight house scales.

(4) The care and record of all real estate, including franchises, leases and all rights of occupancy.

(5) The design of all forms of standard construction.

(6) The treatment and disposition of ties and structural timber.

(7) The responsibility for the safety of track and structures, requiring rigid inspection of all structures to guard against possibility of failure.

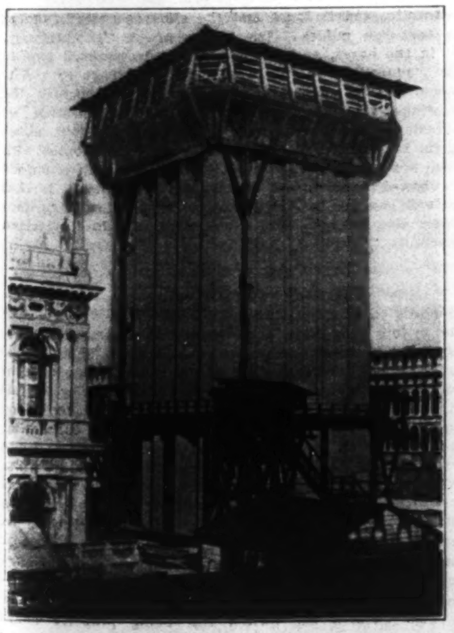


Fig. 5. View of the Campanile During Reconstruction Showing Scaffolding.

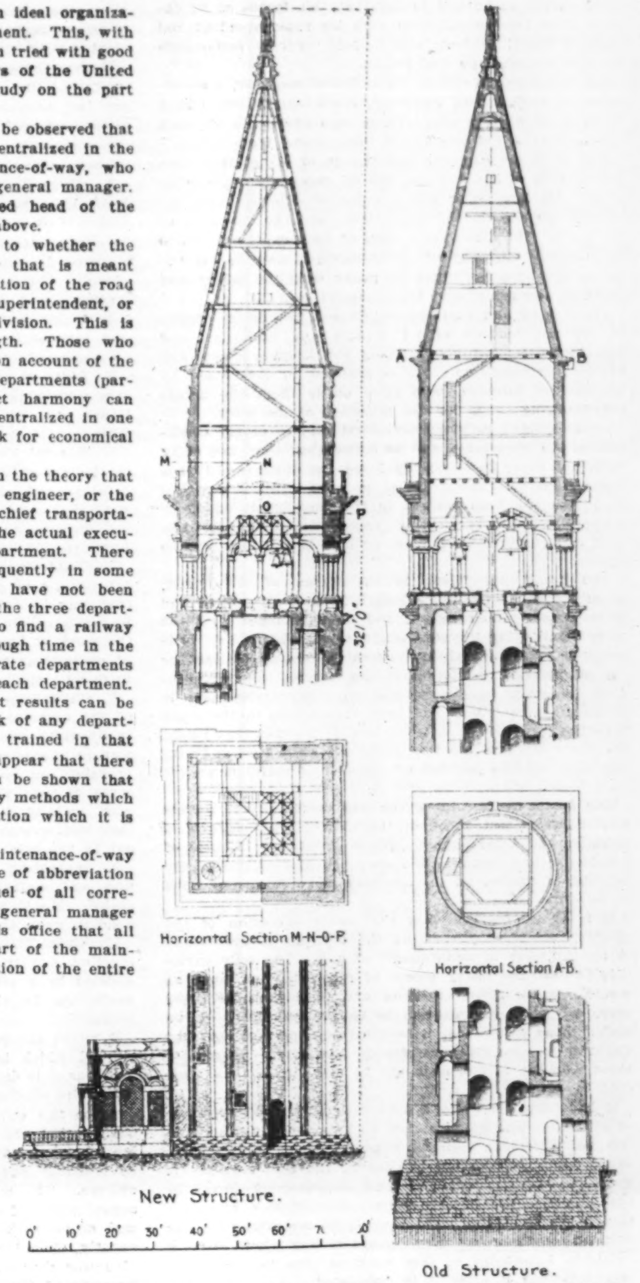


FIG. 4. SECTION AND ELEVATION OF THE CAMPANILE BEFORE AND AFTER RECONSTRUCTION.

The accompanying diagram outlines an ideal organization for the maintenance-of-way department. This, with a few slight differences in titles, has been tried with good results on one of the principal railways of the United States. It is the outcome of careful study on the part of all the executive officers.

In the organization as outlined, it will be observed that the maintenance-of-way department is centralized in the position of chief engineer of maintenance-of-way, who is one of the officers reporting to the general manager. The general manager is the recognized head of the three operating departments mentioned above.

There is a diversity of opinion as to whether the organization should be divisional. By that is meant that all matters pertaining to the operation of the road shall be executed through the division superintendent, or the man in charge of an operating division. This is usually from 250 to 500 miles in length. Those who favor this do so because it is felt that, on account of the close association of the three operating departments (particularly in division operation), perfect harmony can only exist when these departments are centralized in one man, to whom the executive officers look for economical and efficient operation.

People who object to this plan, do so on the theory that the departmental head through the chief engineer, or the superintendent of motive power, or the chief transportation officer, is removed too far from the actual execution of the work of his particular department. There are in the channel of instructions (frequently in some of the intermediate officers) men who have not been trained along the line of one or two of the three departments. Of course it is quite difficult to find a railway officer to-day who has spent a long enough time in the service of the three distinct and separate departments to be proficient in the detail work of each department. The argument is therefore that the best results can be obtained when the execution of the work of any department is entirely in the hands of men trained in that particular department. While it might appear that there is some merit in this argument, it can be shown that the apparent obstacle can be overcome by methods which have been followed out in the organization which it is proposed to discuss.

The office of the chief engineer of maintenance-of-way (called the chief engineer for the purpose of abbreviation in this discussion) is the direct channel of all correspondence and instructions between the general manager and the local officer. It is through his office that all instructions are issued covering any part of the maintenance-of-way work. He has the direction of the entire department and is responsible for making and keeping an effective organization.

He passes on all plans prepared for improvements that are handled by this department. He prepares all standards for tracks and structures, and sees that they are followed. He prepares the annual budget of expenditures for repairs and renewals, and prepares and outlines the plan for expenditures created by the regular maintenance of way organization along the lines of what may be called strictly maintenance and apart from improvements.

He passes upon all contracts that are prepared for matters pertaining to joint interests, leases and agreements covering the use of facilities and all features which are allied to the physical property. In his dealings with the local operating officers, his instructions are issued through the general superintendent.

The general superintendent is in direct charge of a grand district, usually comprising from three to eight or nine divisions, depending on conditions. In him are centralized all of the operating features on these divisions. He has therefore supreme authority over all maintenance-of-way, mechanical and transportation matters in his jurisdiction. He is the channel for all correspondence between the division officers and the chief engineer. He passes upon all plans for improvements prepared by the local officers and submits them through the chief engineer for approval.

He has authority to place the men in the maintenance-of-way department to the best of advantage, except in work of certain magnitude, when he usually requests authority from the chief engineer. It is assumed that he shall direct and supervise the entire maintenance-of-way force in his territory. On transportation matters, he reports to the superintendent of machinery. Thus it will be seen that there is a concentration of authority in him for a certain number of divisions, depending upon the geographical and physical conditions.

He issues all instructions pertaining to maintenance-of-way matters to the division superintendent. The latter has charge of a division ranging from 250 to 500 miles, depending upon quality and quantity of traffic handled, and the geographical location of the lines of the railway.

The division superintendent in a similar manner has charge of the maintenance-of-way, motive power and transportation employees on his particular division. His maintenance-of-way organization is centralized in the engineer of maintenance-of-way (sometimes called roadmaster); his motive power organization in the master mechanic, and his transportation organization in the trainmaster and chief dispatcher. These men constitute his staff.

These three departments being so closely connected from a physical and operating standpoint, it is quite necessary that there should be the greatest harmony between them. In making recommendations for improvements, it is quite desirable that the superintendent should have free consultation with the three departments. The benefit, therefore, of concentrating the entire operation under the division superintendent is readily seen, as a means of not only saving delay in preparing recommendations, but also in the fact that when a plan for improvement leaves the hands of the division superintendent, the other executive officers of the different departments know that the local officers are entirely of one mind.

It can be readily seen, too, that such a method of organization will save a great deal of unnecessary correspondence between the heads of the departments and local officers.

The engineer of maintenance-of-way, who is the head of the maintenance-of-way organization on the division, has sub-departments known as the engineering, track, bridge, building and water service departments. He receives his instructions from the superintendent on all matters pertaining to maintenance-of-way work, and submits through him all matters requiring approval. He is of course authorized to distribute his forces as he desires after free consultation with his superintendent and general superintendent, and is held entirely responsible for the organization under him.

He is assisted in this by an assistant engineer, a supervisor of bridges and buildings, track supervisors and a foreman of water-works. These men constitute his staff and report to and receive all instructions from him.

The assistant engineer has charge of all of the plans and records of his division, and all necessary engineering work. He has under him a corps of efficient men, depending on the size of the division and the character of the work. He should be a man of such experience as to act for the engineer of maintenance-of-way in his absence, but at other times he ranks with the bridge and building supervisor and track supervisor.

The bridge and building supervisor has direct charge of the maintenance of all bridges and buildings, and has the responsibility of making and keeping a safe and efficient organization. He is assisted in this work by his district foremen, who have under them the necessary working gangs for the execution of the work.

He is obliged to make periodical reports of the condition of all structures and to know that they are being examined every 30 or 60 days, and that their condition is reported at all times. He is in most cases a practical man who has been trained in the department which he represents, and is usually competent to handle any kind of structural work from an iron bridge to a wooden trestle.

The track supervisor is in charge of a district, generally about 100 miles long. To him all section and extra-gang foremen report, and he is charged with the responsibility for the safe condition of all tracks. He is required to inspect them frequently, and to outline the use of material and forces in the manner that will produce the most economical and efficient results. He is ordinarily a man who has been brought up in the track department, although it is frequently the case that young engineers are put into this position with a view of training them for the position of engineer of maintenance-of-way.

The foreman of water-works has charge of the organization and maintenance of the entire force engaged in handling the water supply. He is assisted by a corps of repairmen and construction foremen and pumpers, depending of course, on the territory and quantity of work to be done.

It is thus observed that the entire execution of the maintenance-of-way work on the division is centralized in the engineer of maintenance-of-way. The only variation is that for heavy pieces of reconstruction, such as would require more attention and time than he could give, a special organization is usually provided. Even under those conditions, it is generally assumed that the engineer of maintenance-of-way has direct charge of these working forces, although he may not have a great deal to do with the design.

It has been the writer's observation that concentration of all repair and construction work under one head, and fortified with such assisting organization as is necessary, is the only method that can insure the best results. It must be borne in mind that all improvements must be placed under the regular maintenance-of-way organization when completed, and thus it is essential that the division engineer of maintenance-of-way shall have a complete knowledge of this work so that he can properly maintain it after it is completed.

What has been described may be called the maintenance-of-way operating organization. There is in addition to this, a staff of ten officers associated with the chief engineer in an advisory capacity. Each is recognized by the general superintendent, and his authority is recognized by the general superintendent in all matters pertaining to the details of executing work. They are charged with responsibility for the design of structures and standards in their particular departments. They are charged also with maintaining such working forces as may be specially organized for the execution of large pieces of work and to act in an advisory capacity in all matters coming under their jurisdiction. These officers are as follows:

1. Assistant Chief Engineer of Maintenance-of-Way.—He is in charge of matters pertaining to the track department. He handles the distribution of rails and ties and other track material, under the direction of the chief engineer and makes such examinations as are requested by him. He keeps a record of track material, and exercises supervision over the details of track work either through the general superintendent or local officers. His jurisdiction extends over the system and his duties require him to spend a great deal of his time on the road.

2. Engineer of Bridges and Buildings.—He has charge of the design of all bridge and building plans, as well as the responsibility for maintaining the prescribed fire protection. He is assisted by the assistant engineer of bridges and buildings, superintendent of bridges, superintendent of buildings, architect, chief draftsman, and supervisor of fire protection.

He has charge of all extensive pieces of construction work, but his instructions are generally issued through the general superintendent. He is required to exercise a close supervision over the safety of steel structures, and prepares annually a budget of work to be done in the coming year both for bridges and buildings.

He has charge also of fire protection, which is in direct charge of the supervisor of fire protection, under whom are the necessary inspectors for periodically examining all fire protection appliances and the maintenance of the necessary organization and requiring the prescribed drills to keep such organization in a high state of efficiency.

3. Office Engineer.—He has charge of all engineering work that may be handled by the general office. He makes such surveys as cannot be handled by the division assistant engineer, and handles such correspondence as requires the judgment of an educated and competent engineer. He is assisted by an assistant engineer, instrument and rodman.

4. Chief Draftsman.—He has charge of all the maps and records in the general office, and maintains such an organization of draftsmen as is necessary.

5. Right-of-way Engineer.—He has charge of all matters pertaining to handling deeds, agreements, records, leases, etc., and all correspondence in connection therewith.

6. General Foreman of Water-Works.—He has charge of the water service, and is assisted by a corps of inspectors and extra gang foremen in charge of special work that cannot be handled by the division organization. He prepares annually a budget or plan showing necessary expenditures for the coming year in his department.

7. Chief Gardener.—He has general charge of the improvements of station grounds and parks and all work that may be called landscape gardening. He is assisted by an assistant chief gardener, both of them directing the work of beautifying station grounds and the control of plantations for the growth of timber, and any other work of a similar nature.

8. Chief Time Checker.—This is a rather new feature of the organization, designed to overcome the tendency to irregular and dishonest practice on the part of foremen in charge of all kinds of gangs, a condition that is prevalent on nearly all railways. He is assisted by a corps of time checkers who move around over the railway, making daily checks of forces at random, to see that instructions in regard to keeping time are carried out in the minutest detail.

9. Supervisor of Scales.—He has charge of the inspection and maintenance of all track and freight house scales. He is assisted by a number of scale men depending upon the size of the railroad.

10. Chief Timber Inspector.—He has charge of the inspection and treatment of all ties and timber. He is assisted by a corps of inspectors and the necessary organization in charge of the timber and tie treating plants.

It might not be out of the way to briefly describe the method which is used to plan the maintenance-of-way work, as it is done on the railway on which an organization quite similar to this, is working. It was very evident to the writer when the present organization was created that the only way that the general officer could keep in close touch with maintenance-of-way work was by frequent and thorough conference with the division officers. The mistake is often made in large railway organizations of attempting to direct detail from the general office with a very meager knowledge of the frequently changing conditions of labor and weather. A plan was therefore put in effect of calling monthly conferences of the general superintendent, division superintendents, and the division roadmaster (which position corresponds to the position of engineer of maintenance-of-way). At these a full and free discussion is conducted, and a plan arrived at for conducting work, and an appropriation issued therefor, which has to be followed to the minutest detail.

Consequently, once every month a conference is conducted with the officers of each grand district, devoting a day to each of the three districts. The result is that when the conference is ended, there is a clear and distinct understanding as ot what work will be done in the ensuing month. It is frequently the case that it is not possible to allow the division to do all the work desired, and the general officer must necessarily at times make a different distribution of the expense than that recommended by the division, because the earning capacity of the property or the relative necessity of work on different divisions may require an absolute change in plan.

Such a method of appropriation and dividing the expense, however, leads the division officer to feel that his opinion is worth a great deal, and there is a resulting tendency on his part to cooperate to the fullest extent in executing the plan that has been outlined for him. There is an absence of that feeling of disappointment which will often come to a man when his recommendation is not approved, because under this method he is shown the reason for changing his recommendation. The result of this plan has been marked in three features:

(1) There is an absolute fairness that has been the means of producing the greatest harmony and loyalty.

(2) The plan has rendered it almost unnecessary to conduct long and tedious correspondence, as when the conference is over, the plan is so thoroughly outlined that it is understood by all concerned.

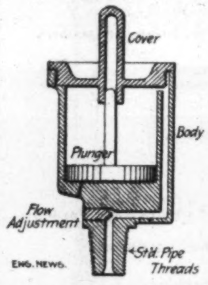
(3) The plan is good training for superinten ho were not brought up in the maintenance-of-w art- ment, in requiring them to be familiar with ils of the work.

In connection with this method, a plan is fect whereby a definite monthly appropriation is ma the different features of maintenance-of-way work each division, which appropriation is for both labor ma- terial. A daily check of the use of material an r is made, so that each roadmaster and supervis ows daily the actual expense of his division up to th ous day. This is along the general lines of the co cial idea, and the result has been that the managi cer knows in advance of the month, what the exp res will be and it has had the beneficial effect of tea the division officer the value of systematizing his w and knowing where his money is being spent.

This plan has been found to be practical, and re- sults have been remarkable.

A CENTRIFUGAL OIL CUP.

An ingenious oil cup intended primarily for lubricating loose pulleys is shown in the accompanying figure. The cup consists essentially of three parts; a cup body, a plunger and an oil-tight cover, all made of a special brass. The cup is filled after removing the cover and pushing the plunger way down. The rapid revolving of the apparatus carrying the cup causes a movement of the plunger, or a tendency to move, toward the cover causing the oil to flow down the by-pass and out the bottom connection to the shaft. The flow of oil is controlled for different speeds of the apparatus carrying the cup by the small screw at the top of the connection. Where it is attached to loose pulleys driven at unusually high speeds, a helical spring is inserted between the plunger and cover to prevent too rapid feeding or too great pressure on the oil. It is claimed that the cup needs to be filled but once a week under normal conditions. This cup is made by the Lawson Manufacturing Co., Buffalo, N. Y., in two sizes, known as Nos. 1 and 2. No. 1 size is intended for use with loose pulleys of 6 to 12 ins. diameter, and No. 2 size for pulleys of over 13 ins.



* * *

A NOVELTY IN BEARINGS.—There has been built by the Straight Line Engine Co. a machine designed by O. C. Kavle, which has a number of shafts, gears and cams, and a crank, connecting-rod and slide. As the shafts are 1½ to 2 ins. in diameter, they are of soft steel, ground, lapped and scraped into cast-iron boxes; the connecting-rod is brass and the slide cast-iron, running in cast-iron guides. The shafts are a tight wringing fit in the boxes, as are the crank and crosshead pins in the connecting-rod and the slide in the guides. The machine runs smoothly at 200 r. p. m. without the bearings showing the least evidence of heating or abrasion. Mr. Kavle tells me he ran a shaft about ⅝-in. in diameter 13,000 r. p. m. for some months with such a fit, and without a particle of oil; when examined it showed a burnished appearance. His theory is that no grit can get in, and it has no excuse for doing anything else but go.—Prof. John E. Sweet in "American Machinist," Sept. 3, 1908.

* * *

A NEW RAILWAY SWITCH has been tried experimentally in England, the special feature of which is that the switch rails have a movement in a vertical arc instead of merely sliding in a horizontal plane. The movement is similar to that of the detector bars used in interlocking plants, except that it is transverse to instead of parallel with the track rails. The device resembles an ordinary split switch, but the head rod connecting the two switch rails is attached to short vertical links or arms on horizontal studs parallel with the rails. When the switch mechanism is operated (in the usual way) the horizontal pressure against the rails causes them to move laterally, and the links compel them to travel in a vertical arc in their movement from one position to the other. An advantage claimed for this arrangement is that there is little liability of any obstruction lodging between the switch and stock rails, while it also ensures the switch rail being properly home against the stock rail in either position of the switch. This switch was described in the July 17 number of "The Engineer," of London, England.

A R KABLE BASCULE BRIDGE AT SYRACUSE, N. Y.

A nion bascule bridge of 44-ft. span recen ilt over the Oswego Canal on the line of Salina St., Syracuse, N. Y., possesses the ed novelty of being located on a sharp ske low the skew was dealt with in the co ion is indicated by the drawings, Figs. 1 herewith, and the two views, Figs. 9 an

ridge suffered a peculiar accident within a ays after its completion, last June. The co weight in the tail of the bridge, formed by a horizontal prism of concrete with embedded steel rods, sheared or slipped off its seat on the west girder; this end fell into the tail pit, while the east end remained attached to the other girder, the counterweight breaking in two transverse to its length. Fortunately, this mishap occurred at a time when the bridge was closed, so that no further direct damage was caused. The indirect damage is very considerable, however, as navigation on the canal was held up for over a month.

As shown by the framing plan, Fig. 2, the bridge, though on a skew of 56°, has its two main girders set square to the crossing. The trapezoid of the deck is framed by end cross girders carried by the main girders and serving to support a system of girders, beams and stringers alined parallel and normal to the axis of the roadway. Regarded as a piece of mechanism, therefore, the bridge is substantially the same as a square-crossing bridge, except that the load is not divided equally between the two trunnion girders, and therefore the counterweight is not symmetrical about the longitudinal center line of the bridge.

This peculiarity does not, however, affect the operating machinery. The latter is novel in the character and location of the drive. A hydraulic jack cylinder is the source of power. With hydraulic drive it is common to utilize the ram thrust directly to push or pull a connecting-rod or "operating strut" attached to the structure by what becomes in effect a crank-pin. In the present case the ram actuates a train of gearing like that used with a rotary source of power, as a hand-lever or an electric motor. The ram motion is transformed into rotary motion by a rack on the piston-rod, meshing with a pinion; from this a gear drive transfers the power to a pair of pinions engaging circular racks. But whereas in most bascule bridges operated by circular racks the racks are attached to the bridge, the operating machinery and pinions being in fixed position on the abutment, the reverse arrangement is found in the present bridge: the operating machinery is attached to the tail of the bridge, while the circular racks are concave and are attached to the rear wall of the tail-pit in the abutment. The machinery is described more in detail farther on.

The pressure water which operates this machinery is the city water, taken direct from the street mains, at a pressure of about 90 lbs. per sq. in. This source of power is thought to give the best possible insurance against interruption due to failure of power.

The structural part of the bridge, characterized by the arrangement of framing already described, has its chief point of difficulty in the support of the long triangular portions which overhang laterally beyond the main girders. (The main girders are 50 ft. apart laterally, while the whole width of bridge between railings at the abutments is about 110 ft.) These triangles are carried mainly by the end cross girders, called cantilever girders from the fact that about 60 ft. of each, more than half its length, is a free overhang beyond the main girders. The overhanging ends act as cantilevers only when the bridge is raised, and have outboard bearings on the abutment when the bridge is closed. The girder at the south end rests directly on the abutment by means of five separate shoes, two of which constitute the main shoes of the bridge at the lift end; they are located, respectively, at the junction points of main girders, the roadway girders (on the curb line) and the sidewalk girders (on the railing line). At the north, or trunnion end, the reaction is intended to be carried by the trunnions both when the bridge is closed and when it is open, and since bearings under the cantilever girder anywhere near the main part of the bridge might be likely to cause lifting or pounding at the trunnions, it was possible only to provide a bearing at the extreme outer end of the cantilever. This is shown by a detail sketch in Fig. 2. The support is obtained by a bracket riveted to the back of the cantilever girder, the girder being located 4 ft. from the face of the abutment. In raising the bridge, the bracket, of course, rises from its seat, and an opening had to be provided in the sidewalk on the abutment to give passage to it; this opening has a hinged cover which is pushed up by the bracket while the bridge is being raised and is drawn down again in the operation of closing the bridge.

While the south cantilever girder is continuous, being riveted across the ends of the main girders, this was obviously impossible in case of the north cantilever girder, which requires to be cut at the west main girder; the two parts are connected across the main girder by flange splice plates above and below. Brackets riveted to the rear face of the cantilever girder carry the roadway over the 4-ft. space between girder and abutment; they are held laterally by a set of diagonal bars in the plane of the top flange of the girder. The brackets produce a thrust against the bottom flange of the girder, and as this flange is in compression it requires to be stayed against buckling. For this purpose a narrow horizontal truss (dotted lines in plan, Fig. 2) is attached to the bottom flange on its southerly side (away from the abutment); the truss is held against sagging by a number of diagonal stays (indicated by double lines in plan, Fig. 2), running up to the top flange of the girder.

The roadway and sidewalk construction is quite fully shown by Fig. 3, except for various skew details of the junction at the north abutment, where the angularity of the clearance lines (circular around the trunnion center) combined with the skew of the bridge axis makes the connections rather intricate and in particular requires special junction castings for the rails. These involve no novelty other than their intricacy, however. The roadway on the bridge is composed of treated wood block paving, 3 ins. deep, on creosoted yellow-pine plank, supported by creosoted wooden joists resting on I-beam stringers. The paving is held from falling out of place when the bridge is open by angle-iron cross ledges, as shown in Fig. 3, set at right angles to the roadway, about 5 ft. apart. The rails have independent stringers, which are of the peculiar shape shown. The top flange of these stringers forms a channel or trough in which the rail is seated, being held down by bolted rail clips of common form; the channel is filled with concrete over the rail base to seat the floor-plank, above which cement mortar is again used to fill the spaces under the rail head.

The curb between roadway and sidewalk is formed by a steel plate attached to the longitudinal girder, as shown by Fig. 3. The joint of the roadway between bridge and abutment is made by a checkered slot-cover plate at the lift end and by a checkered apron plate at the trunnion end.

The grade of the north approach is such as to bring the top surface of the west main girder so close to the roadway as to foul the floor over the tail-pit. The tail of this girder is therefore

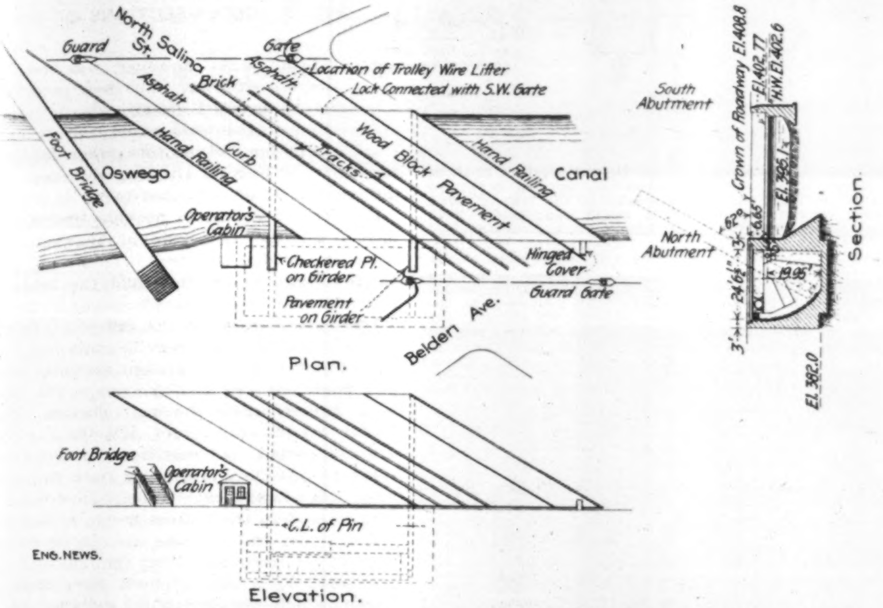

North Salina St.
Guard
Gate
Asphalt
Brick
Location of Trolley Wire Lifter
Lock Connected with S.W. Gate
Foot Bridge
Oswego
Hand Railing
Curb
Tracks
Wood Block Pavement
Hand Railing
Canal
Operator's Cabin
Checkered Pl. on Girder
Pavement on Girder
Hinged Cover
Guard Gate
Belden Ave.
Plan.
Foot Bridge
Operator's Cabin
C.L. of Pin
ENG. NEWS.
Elevation.
South Abutment
North Abutment
Crown of Roadway El. 408.8
El. 402.77
H.W. El. 402.6
El. 382.0
Section.

FIG. 1. GENERAL PLAN, ELEVATION AND SECTION OF SKEW BASCULE BRIDGE OVER OSWEGO CANAL AT NORTH SALINA ST., SYRACUSE, N. Y.

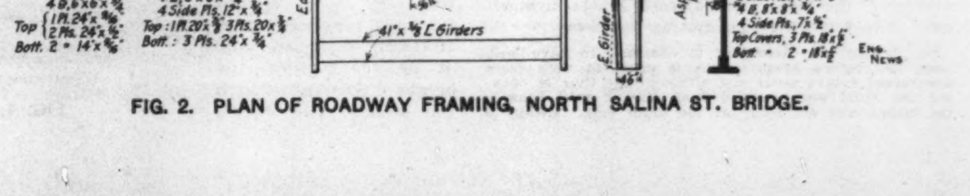

106'4 5/16"
1½" Rods Initial Tension 20,000 lbs.
64½"x½" Web
4 L 6"x6"x½"
45'6"
Hanger
Bracket
Horiz. Truss
Section B-B.
B
East Girder at Pin:
Web 60"x 9/16"
2 Side Pls. 36"x½"
4 L 8"x8"x¾"
4 Side Pls. 12"x¾"
Top: 1 Pl. 20"x3/8" 3 Pls. 20x¾"
Bott.: 3 Pls. 24"x¾"
Max. Section:
60"x3/8" Web
4 L 6"x6"x¾"
Top 1 Pl. 24"x9/16" 2 Pls. 24"x½"
Bott. 2 " 14"x9/16"
East Main Girder
West Main Girder
9'0"
50'0"
Center of Pin
41"x3/8" L Girders
West Main Girder
Cov. Pls. 18"x5/8"
Hole for Trunnion
E. Girder
4'6"
60'5 5/16"
A
7½"x3"x½" Z-Bar
West Girder at Pin:
Web 60"x9/16"
2 Side Pls., 44"x3/8"
4 L 8"x8"x¾"
4 Side Pls., 7"x½"
Top Covers, 3 Pls. 18"x5/8"
Bott. " 2 " 18"x5/8"
Asphalt Paving
Outboard Bearing, Section A-A
ENG. NEWS

FIG. 2. PLAN OF ROADWAY FRAMING, NORTH SALINA ST. BRIDGE.

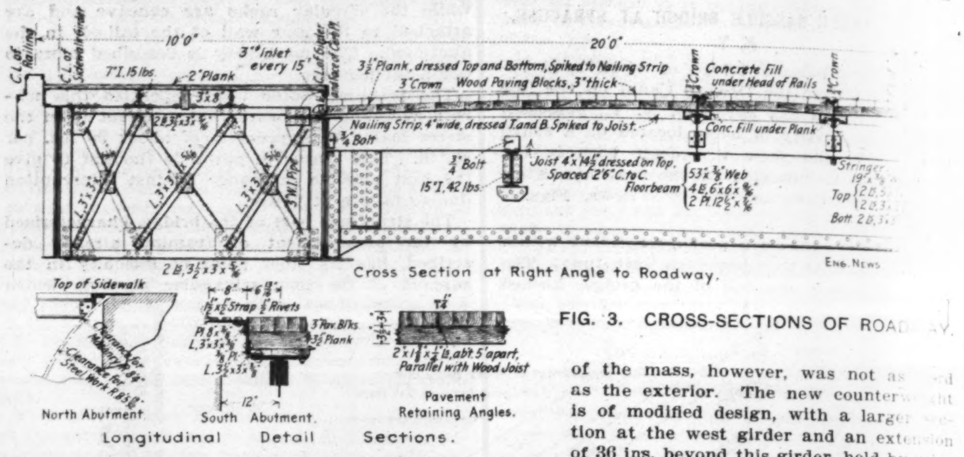

C.L. of Railing
C.L. of Sidewalk Girder
10'0"
7"I. 15 lbs.
2" Plank
3"x8"
3" Inlet every 15'
C.L. of Girder and Face of Curb
3½" Plank, dressed Top and Bottom, Spiked to Nailing Strip
3" Crown
Wood Paving Blocks, 3" thick
20'0"
Crown
Concrete Fill under Head of Rails
Nailing Strip, 4" wide, dressed T. and B. Spiked to Joist.
Conc. Fill under Plank
¾" Bolt
15"I. 42 lbs.
Joist 4"x14½" dressed on Top, Spaced 2'6" C. to C.
Floorbeam
53"x⅜" Web
4 L, 6"x6"x 9/16"
2 Pl. 12½"x 7/16"
Stringer
Top
Bott
3" W.I. Pipe
2 L, 3½"x3"x 5/16"
Eng. News
Cross Section at Right Angle to Roadway.
Top of Sidewalk
Clearance for Masonry
Clearance for Steel Work
Strap
½" Rivets
3" Pav. Blks.
3½" Plank
North Abutment
South Abutment.
12"
2"x1½"x¼" Ls, abt. 5' apart, Parallel with Wood Joist
Pavement Retaining Angles.
Longitudinal Detail Sections.

FIG. 3. CROSS-SECTIONS OF ROAD AY.

tapered, in side elevation, the rear end being shallower than the body of the girder. Where the girders rise above the approach surface when the bridge is raised, that is from the face of the abutment to a point over the trunnion, the floor of the approach is cut away, and here the girders are so shaped that their top surface replaces the pavement when the bridge is down. The west girder at this point is in the paved roadway, and it is faced with a concrete and asphalt paving at the proper height. The east girder, which is not in the roadway, bears a simple checkered steel plate as a tread.

The bridge is substantially balanced about the trunnions, by means of a counterweight of concrete, at the rear end of the tail of the main girders. Fig. 1 indicates approximately the location of the concrete mass, while Fig. 5 gives its detail construction before and after the accident already mentioned, the breaking of this counterweight. The concrete rests on the bottom flanges of the main girders, but to give it additional support the tail of each girder is extended downward, close to its rear end, by a trapezoidal plate hanger in continuation of the web-plate.

The concrete block itself is of intricate shape, to clear the machinery parts and at the same time give the required proportion of weight on the two girders. The east girder, carrying its triangle of overhang at the greater distance from the center than does the west girder, requires by far the larger proportion of counterweight. The original design of the mass of concrete therefore provided for extending the east end of the counterweight beyond the main girder, the parts separated by the girder web being held together by reinforcing rods near the top surface passing through holes in the web. At the west end the counterweight terminated at the girder web and rested on the flange-angles of the girder and the plate hanger. This end, moreover, was much smaller than the east end, as shown in the drawing.

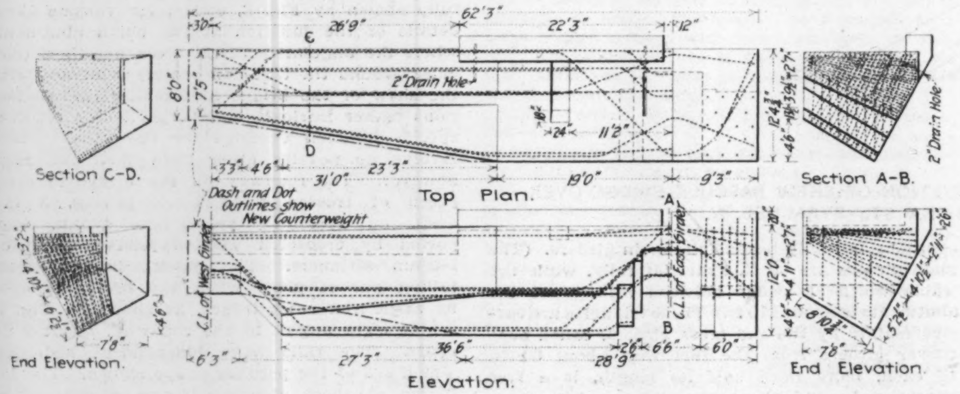
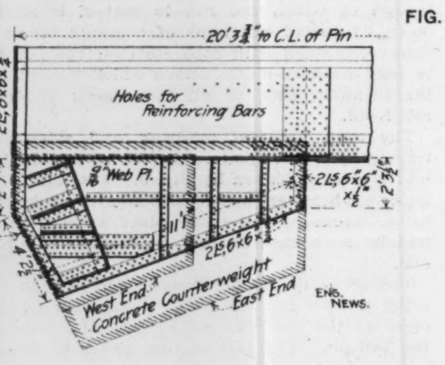

30"
26'9"
62'3"
22'3"
12"
C
D
8'0"
7'5"
2" Drain Hole
24"
11'2"
3'3"
4'6"
31'0"
23'3"
19'0"
9'3"
Section C-D.
Top Plan.
Section A-B.
2" Drain Hole
Dash and Dot Outlines show New Counterweight
C.L. of West Girder
C.L. of East Girder
A
B
12'0"
7'8"
6'3"
27'3"
36'6"
28'9"
2'6"
6'6"
6'0"
End Elevation.
Elevation.
End Elevation.

FIG. 5. REINFORCED-CONCRETE COUNTERWEIGHT.


20'3¾" to C.L. of Pin
Holes for Reinforcing Bars
⅜" Web Pl.
2 L 6"x6"x⅝"
West End
Concrete Counterweight
East End
Eng. News.

The counterweight was specified to be of 1:3:6 concrete, of Portland cement, sand and "clean hard stone." It was actually made in the proportions 1:2½:5. Its failure, occurring after the concrete had had ample time to set (3 weeks) and when the bridge was at rest, seems mysterious. The following explanation is given:

> The bridge was, according to contract, to have been completed before April 1. As is usual in such cases unexpected delays occur and although the time of opening the canal was extended from May 1 until June 1, the bridge was not ready at the latter date. Owing to the great desire to open the canal to navigation on June 1, it was, after careful consideration, decided to remove the forms from the counterweight at the end of three weeks instead of four. This would undoubtedly have been satisfactory had it not been for what subsequently took place. After the forms were removed, the clearances were tested by operating the bridge very slowly by means of permitting the water to escape through a petcock at the head of the operating cylinder, the bridge being opened by excess counterweight. As soon as the clearances had been properly adjusted an attempt was made to raise the bridge by means of the regular operating machinery. After the bridge had begun to move, an attempt was made to check its speed. Thereupon it was found impossible to close the main operating valve, and the bridge in spite of anything that could be done continued to move at full speed until the counterweight struck the pit wall at comparatively high velocity. It is certain that the shock which occurred at this time was sufficient to produce stresses in the concrete great enough to bring about its ultimate failure while in service. The bridge was operated occasionally for approximately two weeks following the incident above mentioned and the counterweight dropped on the morning of June 12.
>
> The fact that the bridge was out of control and struck the pit wall violently when the counterweight was only three weeks old was not fully established immediately after the accident, and pending a full investigation it was decided to rebuild the concrete according to plans which would make the end which failed substantially twice as strong as originally and to permit the concrete to set four weeks before the forms were removed. This program has been carried out and the bridge has been in continuous service for more than a month, showing no signs of weakness in the counterweight.

The weight of the block was 420 tons. The concrete seems to have sheared off near its west end. Being then supported only by the east girder it broke at this girder also. After falling no cracks were found in the mass, in spite of the severe fall. Examined some time after the fracture, the concrete seemed to have acquired good strength, as in breaking it up for removal the breaks often went through the stone. The middle of the mass, however, was not as good as the exterior. The new counterweight is of modified design, with a larger section at the west girder and an extension of 36 ins. beyond this girder, held by reinforcing rods passing through the web. All reinforcement is of deformed bars.

It is the intention to provide timber bumping blocks for the tail ends of the main girders when the bridge is raised. These will be made small enough to crush should the bridge strike them at considerable speed.

The general form of the tail-pit, in which the entire operating machinery is contained, is represented sufficiently for present purposes in Fig. 1. The trunnions are located close to the abutment wall, directly under the main girders. The pins, 14 ins. for the east girder, 12½ ins. for the west, are supported in cast-iron bearings set on concrete pedestals projecting from the abutment wall, and engage each a built-steel jaw or pin-seat riveted to the bottom flange of the girder.

The girder tail sections are about 20 ft. long back of the trunnion. Near the rear end they are connected by a pair of built steel channels between which the hydraulic cylinder is seated. Adjacent to the rear end of each girder a circular rack is bolted to the rear face of the pit, seated in cement. The operating pinions gearing with this rack are carried on a transverse shaft supported by bearings attached to the girders. Near the west girder is a short fore-and-aft shaft, which connects with the operating shaft by bevel gears; this shaft carries a pinion directly over the center line of the ram piston, meshing with a rack attached to the piston-rod.

The cylinder is of cast-iron, is 36 ins. in diameter inside, with 1¼-in. wall, and consists of two sections each 8 ft. 8 in. long connected by bolted flange joint. A 6-in. passage cored in each head connects with a 6-in. pipe from the main valve. The piston is also of cast-iron. A 5-in. piston rod is fastened to the piston by the ordinary taper socket with nuts. The outer end of the rod is socketed in the end of the rack by a 4¼-in. tenon 12 ins. long, held by a flat taper key 1¼ ins. thick by 4 to 5 ins. wide, secured by nuts on a screw prolongation of the narrow end. The rack,

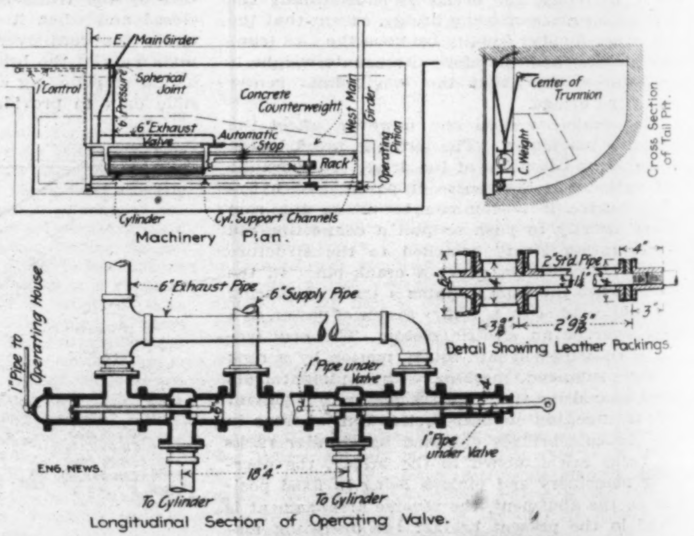

E. Main Girder
1" Control
6" Pressure
Spherical Joint
Concrete Counterweight
West Main Girder
Operating Pinion
6" Exhaust Valve
Automatic Stop
Rack
Cylinder
Cyl. Support Channels
Machinery Plan.
Center of Trunnion
C. Weight
Cross Section of Tail Pit.
1" Pipe to Operating House
6" Exhaust Pipe
6" Supply Pipe
1" Pipe under Valve
1" Pipe under Valve
2" Std. Pipe
4"
3"
Detail Showing Leather Packings
Eng. News.
18'4"
To Cylinder
To Cylinder
Longitudinal Section of Operating Valve.

FIG. 4. PLAN OF MACHINERY AND PIPING.

gears an[illegible] circular racks are steel castings with machine-[illegible] teeth. The straight rack is 12 ins. wide and [illegible] ft. 1 in. long over the teeth, having 41 teeth [illegible] 5-in. pitch. The rack pinion has 11 teeth of [illegible] pitch; its shaft is 7¼ ins. in diameter. Th[illegible] bevel gears, 8-in. face, have 45 teeth and [illegible] teeth, respectively, the latter being mounted on the 6-in. operating shaft; their teeth are of [illegible] ins. circular pitch on the outer pitch line. The operating pinion has 20 teeth, 2¾-in. c. p., 7-in. face. The circular racks are each composed of four sections, with pitch radius of 22 ft. 3 ins., 7-in. face, 27 teeth per section (6 ft. 2¼ ins. long).

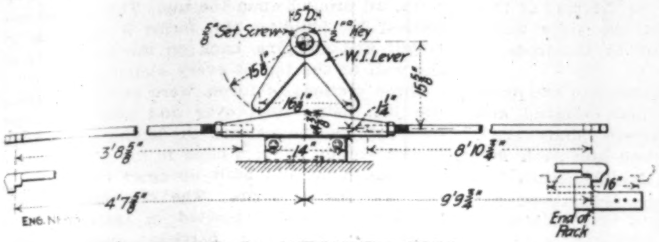


FIG. 6. AUTOMATIC STOP.

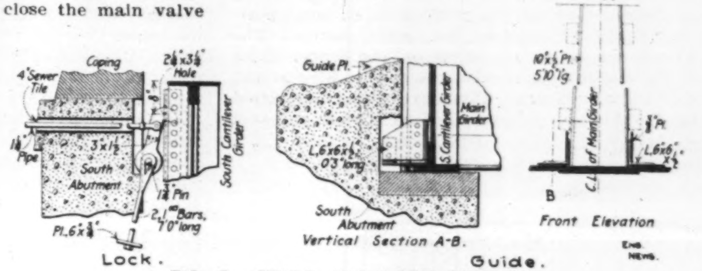


FIG. 7. GUIDE AND LOCK DETAILS.

The cylinder is operated by city water at 90 lbs. pressure. Admission of water to the cylinder is governed by a hydraulic piston valve mounted alongside the cylinder, which valve is itself controlled by a small manual valve in the operator's cabin (located as per Fig. 1). The construction of the main valve and the arrangement of the piping are exhibited in Fig. 4. The valve has two balanced 6-in. valve-pistons, located opposite their respective cylinder ends, and two operating pistons, one 6-in. and the other 4-in., all held together by a long central valve-rod. The inner edges of the valve-pistons control the admission, the outer edges the exhaust. The 4-in. operating piston, at the right end in Fig. 4, is constantly forced to the left by pressure water through a pipe connection from the middle chamber of the valve body. It is overcome, however, by the piston at the left, 6 ins. in diameter, when water is admitted to the chamber of the latter by the manual valve in the operator's cabin, whereby the main valve is shifted to the right; when the manual valve is set to exhaust, the 4-in. piston shifts the valve back to the left.

The arrangement of valve and gear is such that the position which the main valve tends to assume under the pressure of the 4-in. valve-piston closes the bridge. Thus, if the pipe-connection between the operator's cabin and the main valve should break the bridge would close, if open, and if already closed would be held down more firmly to its seat.

Connected with the operating valve is an automatic stop illustrated in Fig. 5. This is actuated by the motion of the straight rack and in turn shifts the main valve by attachment to the projecting valve-rod (at the right in Fig. 4). The wedge block in Fig. 5 is engaged by the rack when the latter approaches either end of its stroke; it then draws the wedge block from a position one side of the middle a sufficient distance past mid-position to close the main valve fully. The double lever above the wedge-block is in mid-position when the valve is closed, while when the valve is open in either direction one or the other of the two crank-arms (Fig. 5) is turned down into a nearly vertical position, thus coming in contact with the wedge-block. Thus in the last 16 ins. of stroke of the rack, the wedge gradually shifts the valve over and closes it, irrespective of the position of the operator's manual valve.

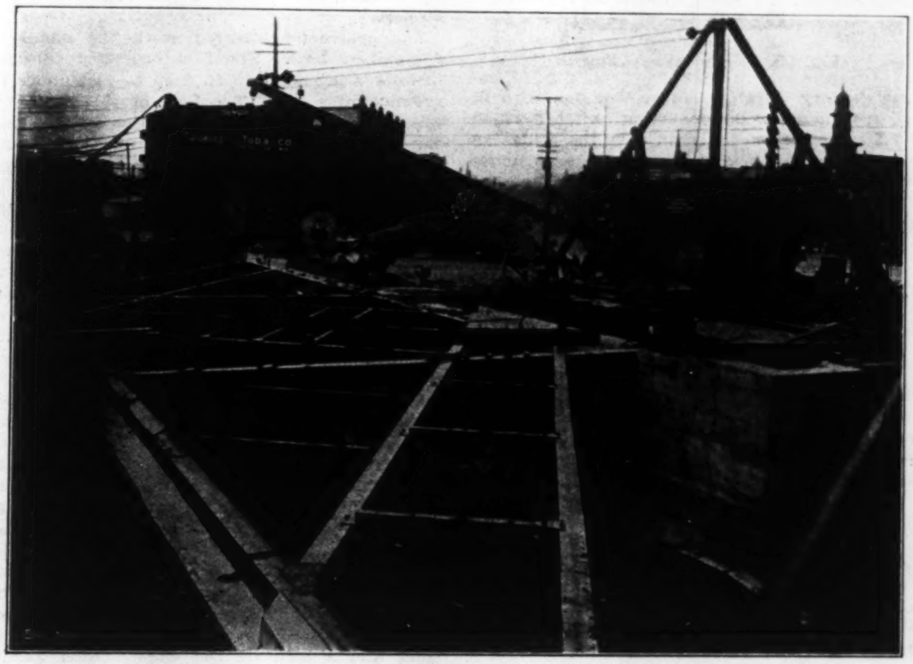


FIG. 8. VIEW OF FRAMING DURING CONSTRUCTION.

The bridge has no latch in the ordinary sense. In the vertical direction the bridge seat fixes its position, while laterally it is held very rigidly by the trunnions. To resist the lateral thrust arising in case the bridge were struck by a boat, there is provided a mortise-and-tenon arrangement at the south abutment, which has a normal clearance of ⅛-in. on either side when the bridge is closed. It is formed by a long tapered guide (Fig. 7), on the abutment, which engages a projecting tenon of the south cantilever girder when the bridge is within four or five feet of its seat. A lock in the vertical direction is provided solely as a means of ensuring the operation of the crossing gates which protect the street on either side. The four gates, two at either end, are operated by compressed air from the operator's house, and move independently. The plan of operation is to close first the northwest and southeast gates, which close admission to the bridge, leaving the other two gates open somewhat later to allow vehicles to pass off the bridge. As soon as the deck is clear, the northeast and southwest gates are closed, and the last-named in closing withdraws the lock. Fig. 7 shows the construction of the lock and indicates the pull-rod which connects it to the gate.

On account of the short span of the bridge it was not thought necessary, as in longer bascule spans carrying trolley lines, to separate the trolley wire on the bridge from that on the approaches and make it, in fact, a part of the bridge, rising with it. For the present case it was thought permissible to carry the trolley wire in one long span from abutment to abutment, so that the bridge can be raised without affecting the wire. Only, as the wire hangs lower than the vertical height of the bridge when raised, the end of the bridge had to be fitted with a device to engage the wire and lift up the slack of the span as the bridge is raised. The device illus-

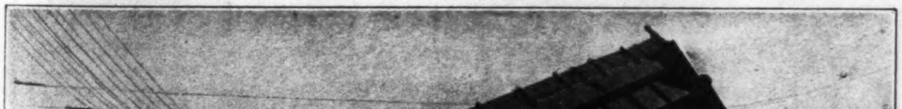


FIG. 9. VIEW OF COMPLETED NORTH SALINA ST. BRIDGE, OPEN.

trated in Fig. 10 was designed for this purpose. It consists of two trolley-wheels carried on arms pinned to a cross-shaft attached to the south cantilever girder, so geared to a weighted pendulum that as the bridge is raised the arms swing up from a folded-down position to an erect position ready to engage the trolley-wires. The wheels are set in the arms on the proper skew to the shaft to aline with the trolley-wire at the moment of contact. This device has been fitted to the bridge, but has not yet been adjusted to satisfactory working. In conjunction with it, of course, there are disconnecting switches which cut off current from the span over the bridge as soon as the bridge begins to rise. These switches were installed by the Syracuse Rapid Transit Co.

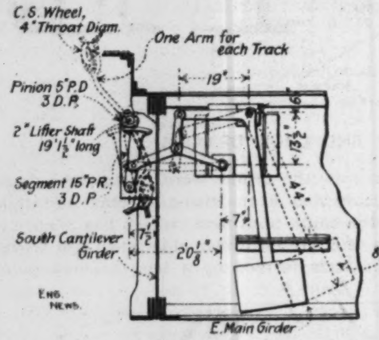


Fig. 10. Trolley-Wire Lifter.

The bridge being balanced by the counterweight, the turning machinery is required to exert only enough force to overcome friction and wind pressure. Its operation has proved to be very rapid, in fact unnecessarily so, and the ports are to be throttled to reduce the time for complete opening or closing to about 40 sec. There is ample reserve of power against the highest winds. The bridge when fully opened is inclined to an angle of about 60° with the horizontal. Most of the traffic on the canal, however, does not need the full opening. The counterweight is slightly in excess of the amount required for exact balance, and the resultant center of gravity is so located that the structure has a tendency to rise, sufficient to overcome the trunnion and gear friction. This overbalance is reduced to zero by the time the bridge has risen about 40°. In the rare event of failure of the water-supply, therefore, the canal can be cleared for traffic by releasing the latch and letting the bridge rise to this position of equilibrium. Restoration of the water-supply would then be necessary before the bridge could be closed again.

The bridge was built in the closed position. Mr. J. M. Schultz, of Syracuse, was the contractor. The Cowing Engineering Co., of Cleveland, O., built the steel work. It was designed by the bridge department of the State Engineer's Office, at Albany, N. Y., under Mr. Wm. R. Davis, Chief Bridge Designer, to whom we are indebted for drawings and information about the bridge.

SINKING A REINFORCED-CONCRETE MINE SHAFT NEAR WILKESBARRE, PA.

By LOUIS L. BROWN[*], M. Am. Soc. C. E.

On the flats just across the Susquehanna River from Wilkesbarre, Pa., the Delaware, Lackawanna & Western R. R. is now sinking a shaft for their Woodward Colliery, in the first 80 ft. of which a reinforced-concrete caisson was used to penetrate the extremely wet and porous overlying strata of earth. From borings it was determined that considerable difficulty would be encountered in sinking through these layers of sand, gravel and quicksand above the rock strata, which lies about 79 ft. below the surface, especially as the water level in the soil maintains about the same level as the river, which varies constantly, at times flooding the whole country at this point. The quantity of water to contend with in any sinking proposition would have been so great, on account of the proximity of the river, that some special method had to be devised for sinking the shaft and connecting it with the rock strata and making it practically water-tight, in order that the subsequent sinking through the rock to the coal-bearing veins could be proceeded with. The damage which would result by the flooding of the mines through any failure on the part of this shaft construction to hold out the river water with its floods, would amount to hundreds of thousands of dollars.

After considering all these features of the proposition the railway company had designed and constructed a reinforced-concrete shaft wall, which was built up above ground and sunk into place by excavating beneath it. This work has been referred to in some of the engineering papers, not so much on account of the engineering features involved, but more particularly in regard to the necessity of extraordinary methods being adopted successfully to mine anthracite coal, having in mind the prevention of waste and conservation for the future supply of coal. However, the unusual engineering features and difficulties encountered in prosecuting this work are of particular interest to the engineering profession.

The contractors started work the middle of September, 1907. The first operation consisted in excavating a pit 15 ft. deep to just above the ground-water line. The bulk of this earth was taken out by scraper teams, the steep sloping sides being finished with two derricks which had been erected while this scraper excavation was going on. The bottom of the pit, roughly 65 × 33 ft., was then leveled off and the steel cutting edge (Fig. 1) 59 ft. 6 ins. × 28 ft. was set up and assembled. This cutting edge or shoe was made of ¾-in. plate, well reinforced with riveted angles. The outside vertical plate of this shoe was 32 ins. high and the shelf which carried the green concrete and afterwards protected it during the sinking was 24 ins. wide and 8 ins. above the toe of the vertical plate.

During the time that this excavation had been going on a gang of carpenters had been building three complete sets of inside and outside forms. After the cutting edge had been carefully leveled up the first section of these forms was set up and firmly braced, tie-rods as well as the ordinary pushing braces being used. The closely spaced 1 × 1¼-in. reinforcing rods were then placed and the concrete deposited. The outside form of this first section was built plumb, while the inside was battered back so that the concrete wall sloped up to a 7-ft. thickness on the sides and a 5-ft. on the ends. Other vertical forms were then set up and concreted until a total height of 20 ft. was reached, when the bottom forms were removed and th[illegible]isson carefully leveled up and prepared for s[illegible]g.

The concrete walls were so designe[illegible]g. 2) that starting with a maximum thickne[illegible] 7 ft. on the long sides and 5 ft. on the [illegible] they would finally reach a uniform thickne[illegible] 2 ft. 8 ins. all around upon the top. This w[illegible]ccomplished by building the forms 9 ft. [illegible]s. in height and stepping back on the insi[illegible]e of the wall at the top of every section of [illegible].

Three sections of forms were used to [illegible]plete the job, being used over and over a[illegible] for example, as the caisson in sinking ca[illegible] the lowest section of form close to the grou[illegible] was then taken off and built up again on th[illegible]op of the last placed form. The concrete [illegible] machine mixed and deposited in these f[illegible]s by means of the two derricks and c[illegible]opean buckets. This concrete was mixed in [illegible] proportions of 1:2:4. The total reinf[illegible]ment amounted to 140 tons.

The shaft being designed with three compartments, an airway, pumpway and hoistway, the two partition walls were carried up with the other work. These helped materially to strengthen the outer walls against the lateral earth pressure as the caisson was being sunk.

While it had been considered possible to sink the caisson down to rock without the use of compressed air, yet, on account of the great volume of water in the soil it was by no means certain that the open method of sinking would be successful. For this reason the contractors designed a heavy timber deck and all arrangements were made so that the changing over from the open method to that of the pneumatic process could be carried out without loss of time. The possible use of an air deck necessitated leaving in all the shaft walls a recess into which it could be fitted. This recess was located 8 ft. above the cutting edge, was 9 ins. deep and 39 ins. high.

The deck was designed to be built of two courses of 12 × 12-in. timbers, dressed; the two courses being bolted at right angles to one another. The whole deck could then be securely wedged into the recess and further strengthened by inclined braces from the shaft walls to the center of the span of the deck. Openings were to be left in the deck to which would be bolted the air locks through which buckets for handling the material would pass. This would make a very roomy working chamber, the whole method closely resembling that used in sinking bridge piers.

Before starting the sinking two single-acting pumps of a combined capacity of 1,400 gals. per min. were placed on timbers about 8 ft. above

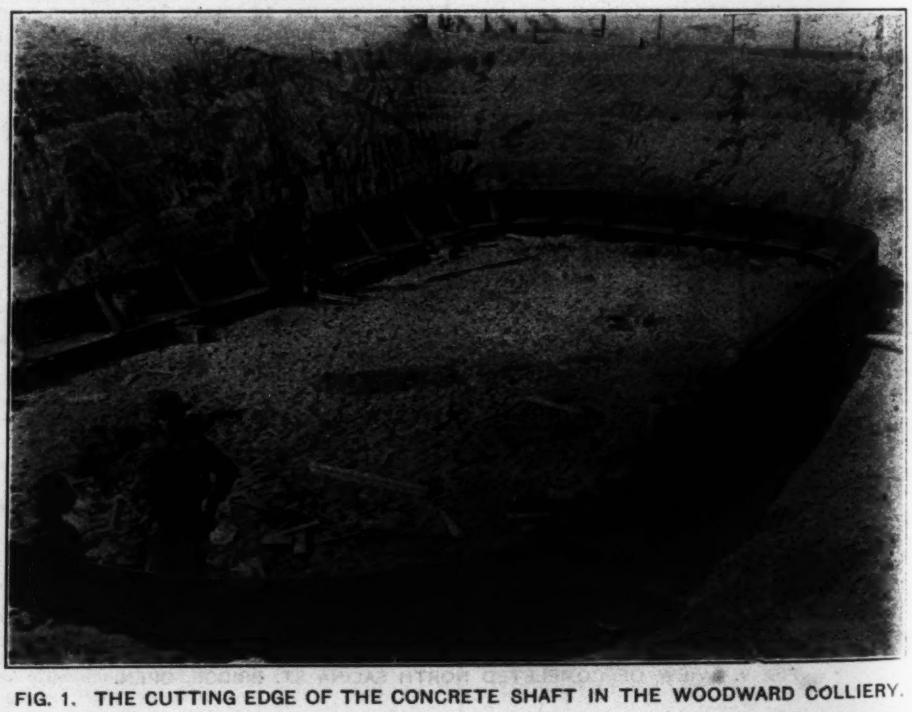


FIG. 1. THE CUTTING EDGE OF THE CONCRETE SHAFT IN THE WOODWARD COLLIERY.

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[*] General Superintendent, The Foundation Co., 115 Broadway, New York City.

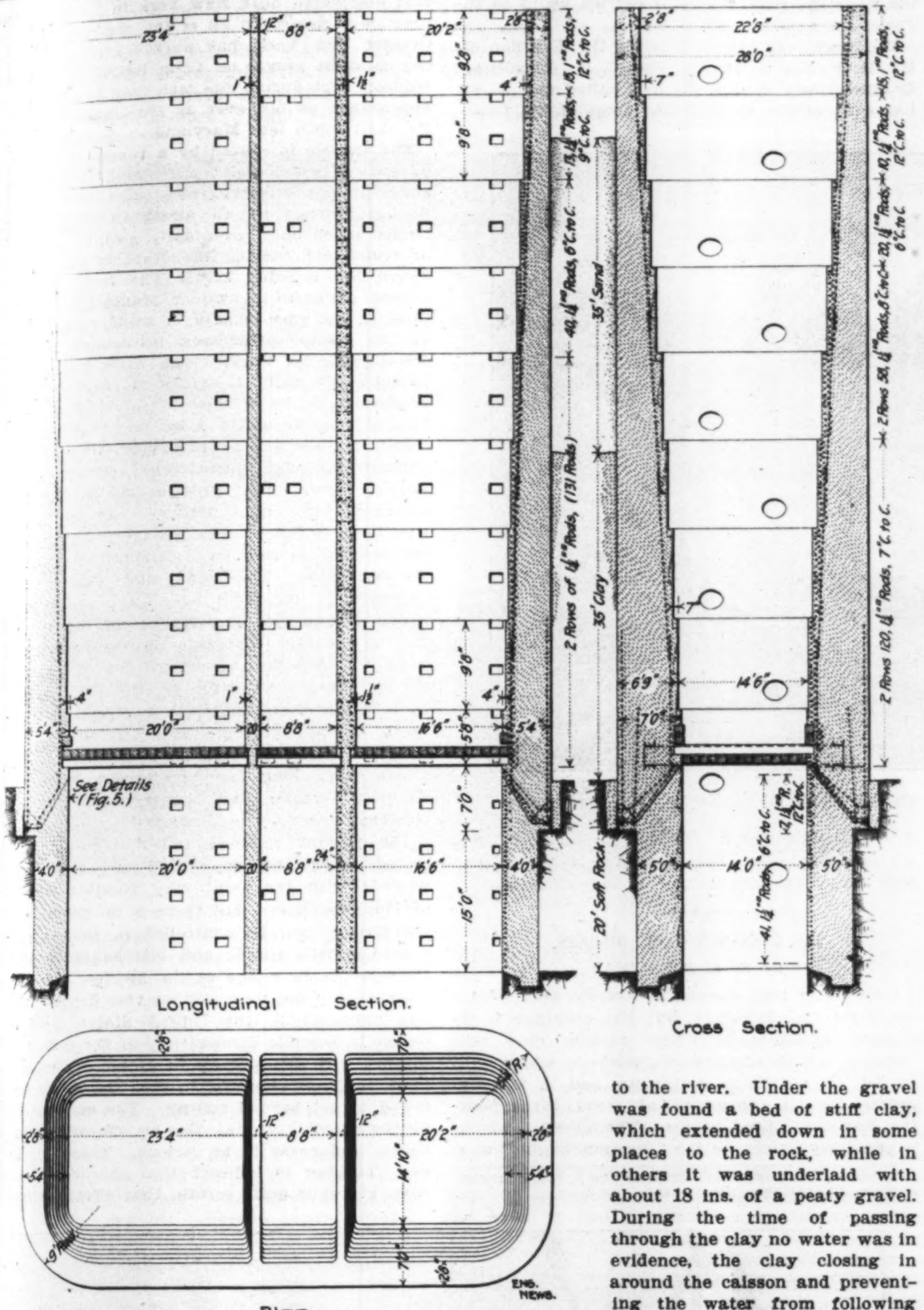

FIG. 2. DETAILS OF THE CAISSON.

the cutting edge and sinking operations started on Nov. 7, 1907.

This sinking was carried on both day and night, two 10-hr. shifts being used. Each gang excavating in the bottom of the shaft consisted of a foreman and 16 men. The material as it was excavated was shoveled into ½-cu. yd. buckets, which were hoisted out by two stiff-leg derricks. These derricks had 45-ft. booms, and as the buckets were hoisted out they were automatically dumped into 1½-yd. dump cars, which were run in on four sidings close to the caisson. These cars were then pulled by mules out to an adjoining field, where they were dumped and the empties run back.

In sinking, quicksand was first encountered, then gravel was passed through. As the open excavation had been carried down to within one foot of the ground-water line the pumps had to be started with the very first of the sinking, and by the time the gravel was reached were handling 1,200 gals. of water per min. As the job was entirely surrounded by truck gardens this water, carrying a large percentage of sand, could not be discharged at random, for numerous lawsuits would have resulted. A box trough 2½ ft. wide by 8 ins. high was therefore built and run for a distance of a quarter mile to the river. Under the gravel was found a bed of stiff clay, which extended down in some places to the rock, while in others it was underlaid with about 18 ins. of a peaty gravel. During the time of passing through the clay no water was in evidence, the clay closing in around the caisson and preventing the water from following down and coming in under the cutting edge.

The sinking of such a large mass of comparatively green concrete was of course attended by considerable difficulty, requiring the constant attention of men skilled in the work. Inasmuch as one of the shaft compartments is to be fitted with guides for two elevator cages the question of plumbness alone was a big factor. Levels were taken at frequent intervals and the excavation carried on in such a way that the walls as they sank maintained a practical plumbness.

As can be readily imagined, in a length of 60 ft., it was frequently found that soils of different consistencies were encountered at the same time at the ends of the caisson. The caisson at such times required very careful handling and had to be nursed through such strata so that one end would not crush rapidly down while the other hung up. An average excavation of from 90 to 100 cu. yds. per 10-hr. shift was considered good progress.

While cleaning off the rock the river rose rapidly, due to a heavy rainfall, and flooded the flats. The increased head resulted in the water being forced down between the clay and the sides of the caisson. This water came in under the cutting edge and rose so quickly that the pumps could not handle it, and they were soon drowned out and the shaft filled up. Extra pumps were immediately shipped to the job, and the task was commenced of lowering the water, so that the leaks could be stopped.

The pumps were of the piston-packed variety and worked satisfactorily until the water was lowered to about 10 ft. above the cutting edge. Then, owing to the fact that this water carried in with it large quantities of sand and gravel, a great deal of trouble was experienced keeping these pumps in running shape. This sand not only wore out the packing, but also the water cylinders to such an extent that the piston slippage was so great that even the largest of the pumps could handle but little water. On this account sufficient extra pumps had to be installed so that the shutting down of any one pump for repairs would not cripple the job. The addition of a motor-driven centrifugal pump of 1,000 gals. capacity also helped materially, and the water was then lowered to below the cutting edge. This made a battery of nine pumps, as follows: One Worthington 22 × 10 × 18-in. Duplex, one Worthington 10 × 6 × 10-in. Duplex, one Worthington 16 × 9 × 12-in. Duplex, one Knowles 16 × 10 × 24-in. Single, two Knowles 14 × 8 × 12-in. Single, one Knowles, 18× 14 × 20-in. single, one Knowles 14 × 6 × 12-in. single, one 1,000-gal. Jeanesville centrifugal pump, motor driven.

It can be readily seen by the number and size of the above pumps and the fact that the available space was necessarily limited that the dividing line between the open and air method had been reached, and if more water had been encountered the use of compressed air would have been necessary. When the excavation reached the rock it was found that it would be necessary to construct a temporary seal between the rock and the shoe for the whole perimeter. This was done by means of 12 × 12-in. yellow pine blocks and white pine wedges. As the work progressed 6-in. pipe bleeders were left in to handle some of the water and thus relieve the pressure at the points at which the men were working to put in new blocks.

Owing to the constant fluctuations in the height of water in the bottom, due to numerous troubles with the pumps and also the difficulty of keeping the sand and gravel back during the work, the final sealing was a slow and tedious operation. Also as this work was done during the latter part of January, when the weather was extremely cold, the men suffered terribly from the necessity of working in wet clothing. After the last blocking had been wedged in place the bleeders were closed off and the inflow of water, with the exception of some minute squirting streams, checked. These streams were speedily calked with white pine wedges, resulting in a practically dry bottom.

The next proposition was to take out the rock to a depth of 20 ft. and build up an underpinning wall to carry the weight of the caisson

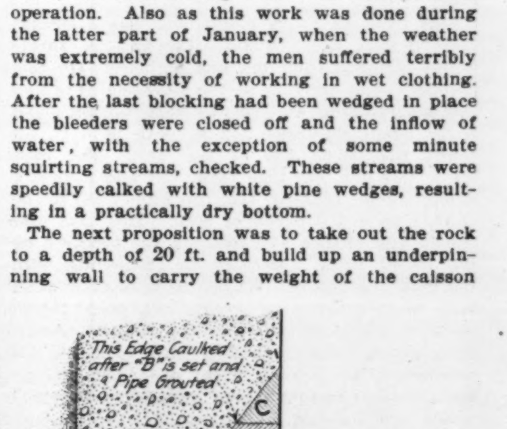
This Edge Caulked after "B" is set and Pipe Grouted
C
Step cut in present Concrete
B
Wooden Blocks and Wedges
Pipe to lead Water off while Concrete being put in
Broken Stone packed in betw. Brick and Wood
Brick Dam to lead Water into Pipes
A
Method:
1, Concrete "A" put in Place as soon as possible.
2, Concrete "B" put in.
3, Grout Pumped into Pipe after "A" and "B" is set.
4, Concrete "C" put in after every thing has been made tight.
ENG. NEWS.

Fig. 3. Joint Between Caisson and Rock Bottom.

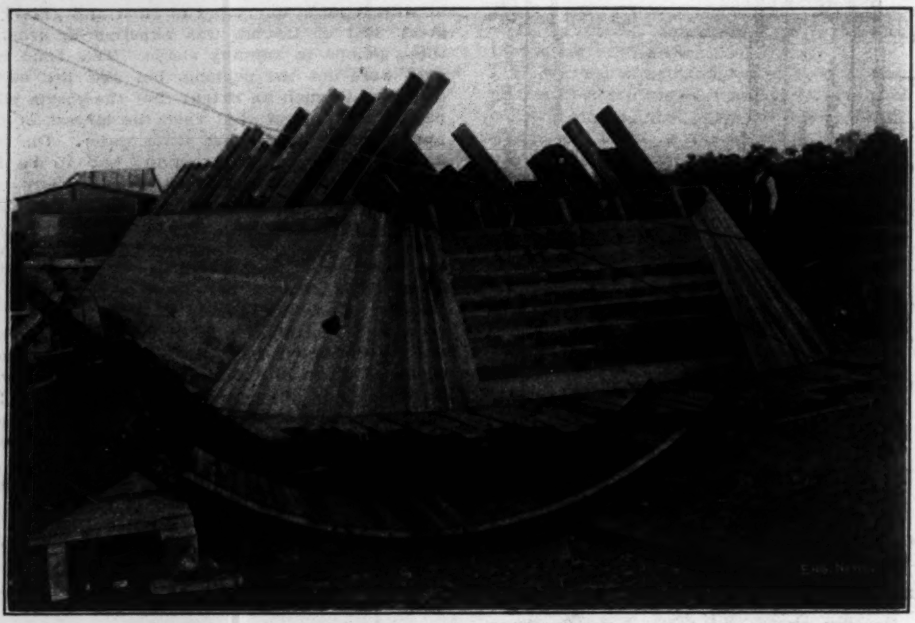

FIG. 4. FORMS FOR INSIDE OF BOTTOM OF SHAFT.

and make the permanent seal to keep out all water. To avoid the possibility of jarring loose any of the temporary sealing blocks or breaking back under them the rock, which was of a slatey nature, this excavation was started by channeling out for a depth of 5 ft. all around the shaft about 1 ft. inside of the blocking. The rock was then taken out in the ordinary manner with two shaft bars and four rock drills in operation. To further prevent the jarring of this blocking the rock was taken out in 5-ft. benches only. This made the work necessarily slower, but it was deemed advisable and so proved, for notwithstanding the care exercised, certain leakages occurred which made the rock excavation slow on account of the shifting of pumps, taking off and putting back suction pipes, etc.

This rock, as above mentioned, was a species of sand slate which would break back a considerable distance from the line of holes. On this account, upon arriving at the elevation at which the underpinning wall was to start, the rock had to be again channeled for a depth of 5 ft. all round the inside line of the wall. The rock inside this line was then taken out and formed a sump which enabled the concrete wall to be started on a dry bench of rock. This also precluded any chance of damaging the concrete by the heavy firing necessary in proceeding with the rock excavation. While this rock excavation had been progressing grout had been forced back of the blocking under the shoe by means of a grout pump operating with an 80-lb. air pressure. This gradually cut down the leakage until that remaining about equaled that which would flow through a 2-in. pipe.

Before starting the concrete underpinning wall the rock footing was carefully cleaned off and a recess cut in it to form a stout toe for this wall. Various seams in the rock emitted water. This was handled during the building of the wall by fitting a small wooden trough around the wall and leading the water beyond the face of the wall through pipe bleeders. Grout pipes were also inserted in the tops of these troughs, led beyond the face of the wall and grouted after the concrete had set sufficiently to resist the resultant pressure.

To help bond the underpinning wall to the caisson proper and help carry its weight the inclined face of the concrete above the shoe was not only roughened, but also had a 1-ft. step cut in it. Fig. 5 shows very clearly the method of making the permanent seal between the shaft wall and the rock.

To prevent the possibility of the flooding of the shaft by any high stages of the water in the river the shaft wall was carried up to 15 ft. above the general ground level.

The work was executed under the direction of Mr. R. V. Norris, M. Am. Soc. C. E., Consulting Engineer, and Messrs. R. A. Phillips and A. C. Lamonte, of the Coal Mining Dept of the Delaware, Lackawanna & Western R. R. The contractors were The Foundation Co. of New York, with Mr. Alexander Allaire as Superintendent.

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THE CHESTNUT BARK DISEASE.

By E. A. STERLING.[*]

Interest in tree disease is usually confined to botanists and foresters, but the chestnut bark disease which is spreading rapidly over the country has an economic significance which will be felt by engineers, architects, and in fact by practically all consumers of wood throughout the Eastern United States. The disease, which is popularly known as the "chestnut blight," was first discovered near New York in 190 has practically destroyed all of the chestnu s in Greater New York, has worked great to the chestnut groves on Long Island a the Hudson, and during the last year has its appearance as far west as Huntingdo nty, Pa., and south into Maryland.

The trouble is caused by a fungus (D rthe parasitica) which gains a foothold thro any abrasion in the bark. Once established in-fection spreads in all directions thro the tender inner bark, eventually girdling imb or trunk and causing the death of the rtion above the infected area. The fruiting dies appear as small, brown or orange-color pus-tules on the smooth bark of small limbs hich, as the disease progresses, become sunk and discolored. On thick, rough bark, the ting pustules are seen in cracks of the bark. Reproduction is by spores. The presence of the fungus may be detected by the dead tops and limbs of trees and by the brown leaves on the portions affected during the current season. Mature trees, second growth, and seedlings are attacked with equal activity, and the disease has been found on the Paragon, an imported nut-bearing species, in a commercial grove in Pennsylvania. The oaks and other related genera seem immune.

The commercial importance of the question lies in the fact that this disease threatens to wipe the American chestnut out of existence. To all consumers of timber, the elimination of the chestnut from our Eastern forests will come as a distinct personal loss. It also has an aesthetic consideration, in that veteran trees, which have long been prominent features of suburban estates and country homes, will be rendered unsightly or destroyed.

The prompt removal and destruction of infected limbs and trees and the painting of wounds with tar paint may possibly save individual specimens, but there is no promise that ths disease can be controlled in the extensive second-growth stands and merchantable timber throughout the range of the species. It is unquestionably the most serious tree disease which has appeared in the United States, and surpasses in possible damage any of the insect visitations, with the possible exception of the gypsy moth in Massachusetts, in case the moth is allowed to get beyond control. The one hope lies in the possibility that the disease will run its course and cease to be serious. There is, however, nothing to indicate that this will be the case, and it is quite certain that effective means

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[*] Forester, Pennsylvania Railroad Co., Broad Street Station, Philadelphia, Pa.

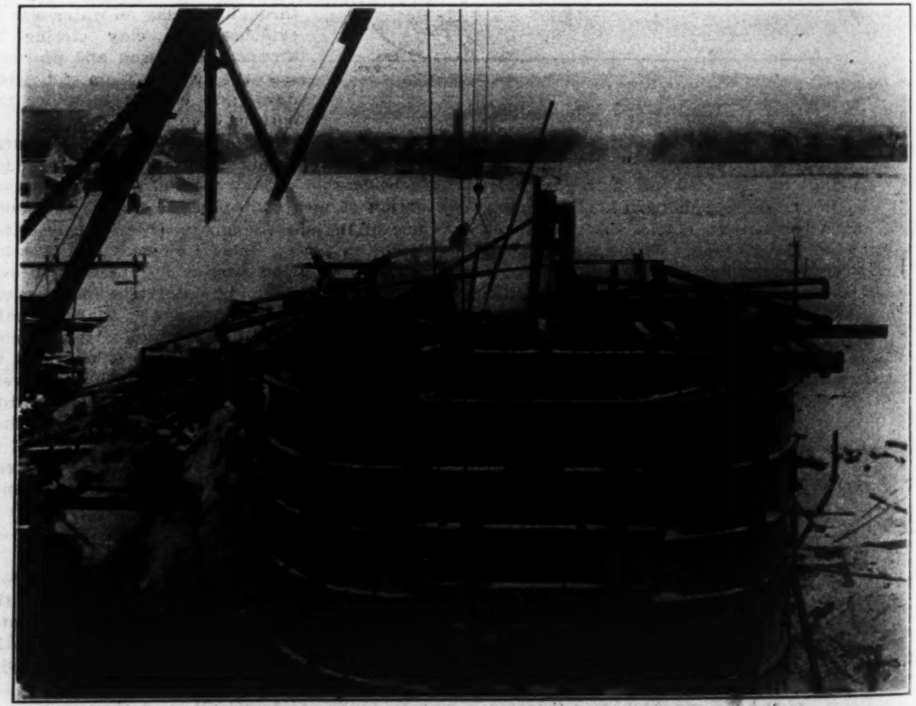

FIG. 5. CAISSON IN PROCESS OF CONSTRUCTION.

of control by quarantine or otherwise, will not be found.

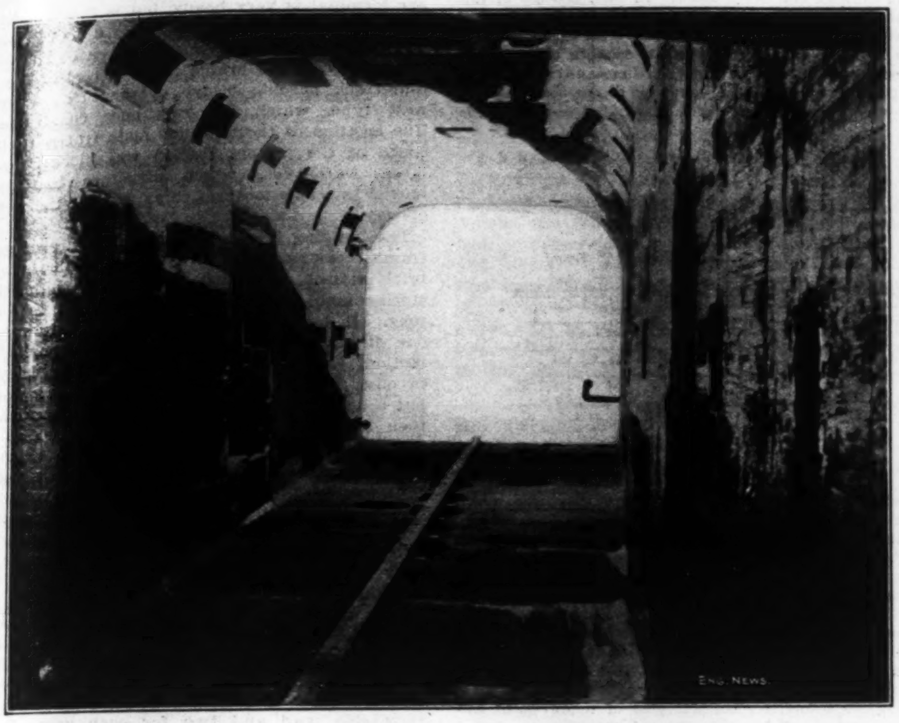

FIG. 6. VIEW LOOKING UP THE FINISHED SHAFT.

The full value of the American chestnut from a purely commercial standpoint will not be fully realized until chestnut timber is no longer available. The wood, to be sure, is light, rather soft, and not very strong, but owing to the high percentage of tannin, it is very durable in exposed situations and is extensively used for rough construction, railroad ties, posts, fencing, cabinet-making, etc. The weight of seasoned wood is 28 lbs. per cu ft., which is 2 lbs. more than yellow poplar and 12 lbs. less than red oak. The modulus of elasticity is 1,200,000, as against 1,600,000 for red oak, 1,150,000 for white oak, and 1,300,000 for yellow poplar. The modulus of rupture is 9,800, against 10,800 for white ash, 11,400 for red oak, and 12,400 for white oak. In addition to its timber value, chestnut is very rich in tannin, and the tanneries annually consume large quantities of this product.

From statistics compiled by the U. S. Bureau of Census and the U. S. Forest Service for 1907, it appears that the cut of chestnut lumber for that year was over 650,000,000 ft. B. M., which, at $17 per M., gives an aggregate value of $11,000,000. Of the 100,000,000 cross-ties used annually by the railroads of the United States, chestnut furnishes approximately 6%, the exact figures for 1906 being 6,588,000, valued at nearly $3,000,000. Since the chestnut is indigenous only east of the Mississippi, the consumption of chestnut cross-ties is confined to the Eastern railroads. We thus find the New York, New Haven & Hartford R. R. using chestnut ties almost exclusively. They cost this road 60 to 65 cts. each, and give an average life of about six years in main track. Other Eastern railroads which operate through regions where the chestnut is indigeneous utilize large quantities of chestnut ties, the percentage used decreasing towards the West and South, where oak and yellow pine are available. Out of 59 railroads reporting on standards of track construction in Engineering News of June 4, 1908, 15, or 39.3%, mention the use of chestnut cross-ties, the prices paid varying from 45 to 65 cts.

In the coal mines of the United States, some 30,000,000 cu. ft. of round chestnut timber is used every year for mine props; while the extract plants utilize thousands of cords of chestnut tops and limbs which would be unavailable for other purposes. It is a safe estimate that the output of chestnut lumber, cross-ties, mine props, and extractwood is worth $20,000,000 annually, while in addition we have an enormous consumption of chestnut posts, rough lumber, fuelwood, etc., by the farmers, the value of which cannot be even approximated.

The spread of the chestnut blight and the ultimate destruction of our chestnut forests will probably mean an annual loss to the United States of from twenty-five to thirty million dollars. As a secondary result, the consumers of wood will be hard to find a substitute for chestnut at equal cost; while the increased demands on other species will still further increase their value and bring clearer realization that a timber famine is almost upon us.

Another serious phase of the question lies in the fact that the chestnut, because of its rapid growth and the ease by which it can be reproduced, occupies a most important place in the intensive management of our forests, and its loss will delay by just so much the systematic conservation of our forest resources.

TOPOGRAPHIC MAPPING OF BOTTOM LANDS IN ILLINOIS.*

By E. W. McCRARY.†

The last General Assembly of Illinois made a small appropriation for the beginning of surveys and studies of the over-flow lands of the State, for the purpose of acquiring a knowledge of their existing conditions, and the methods by which the needed improvements may best be made. In accordance with this legislation, the State Geological Survey last year began the topographic mapping of portions of the Kaskaskia, Big Muddy and Embarass rivers, in which it cooperated with the topographic branch of the U. S. Geological Survey. Cooperative topographic mapping having been arranged in quadrangles adjacent to these streams, much of the control work of the regular survey, has, with slight modifications, been utilized for special drainage work. This has made it possible, at the least possible expense, to produce during the past season a 5-ft. topographic map on a scale of 1:24,000 of approximately 200 sq. mi. of these river bottoms.

The purpose of the Survey in doing this work along the river courses is to furnish a detailed topographic map, sufficiently accurate to be of practical value to the engineer in the planning of any proposed drainage improvements and the estimating of costs for same. While the question of the scale has been somewhat perplexing, it is believed that the 1:24,000 scale will prove adequate for the uses for which it is intended, since it is sufficiently large to contain all detail that would be taken into account in the planning of these improvements. It has the additional advantage of permitting large sections of country to be mapped on a single sheet of paper, thereby presenting in a collected form the conditions in different sections of the bottoms. Also because of its much reduced cost, which must be considered with a limited appropriation, it has a very strong claim to consideration.

Of the 160 sq. mi. of mapped country, a portion of the Kaskaskia River bottoms, 130 square mi. are under from 1 ft. to 8 ft. of water several times each year. The overflow season usually begins in January, and at times lasts as late as the middle of August, which makes the season, in which the land is dry enough for cultivation, entirely too short for successful farming. It seems to be generally necessary to plant several times each spring, and even with the last planting they cannot hope for a yield to the full capacity of the land. It has been stated that a successful crop, one that has escaped damage by the flood, does not occur oftener than once in seven years. In fact, so completely is this river in possession of its bottom lands that very little effort is made to utilize it in any way, and at the present time it might well be considered mere waste land.

Before the uplands were reclaimed by tiled drains, a rainy season of even a week's duration, produced but a slight increase in the flow of the channels of these streams. This was due to the fact that the rain collected in enormous areas of marsh and lowlands, and reached

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*From Year Book of Illinois State Geological Survey for 1907.

†Assistant Engineer, Illinois State Geological Survey, Urbana, Ill.

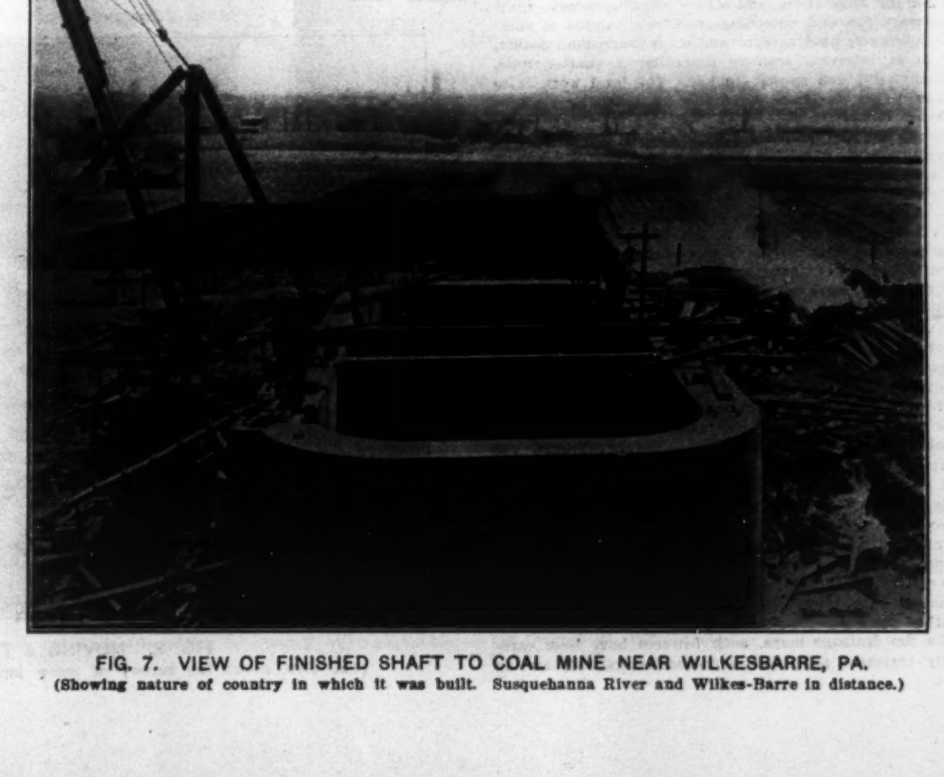
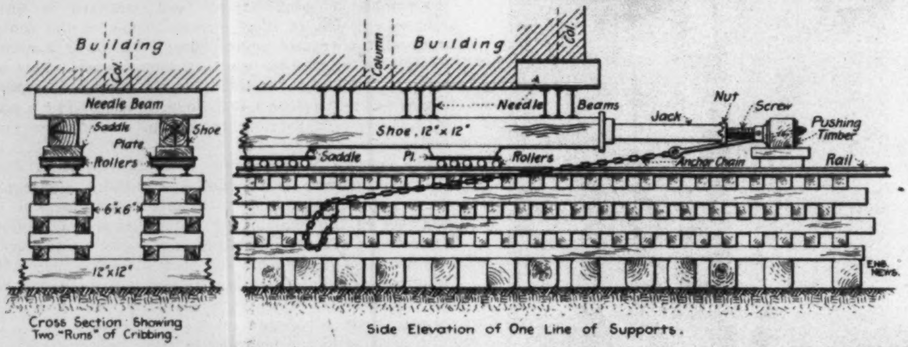


FIG. 7. VIEW OF FINISHED SHAFT TO COAL MINE NEAR WILKESBARRE, PA.
(Showing nature of country in which it was built. Susquehanna River and Wilkes-Barre in distance.)

these river courses by a very slow and tedious process. The experience of the past summer, while making topographic surveys along the Kaskaskia River, shows that a rain of 24 hours will now raise the stream from 4 to 10 ft. An explanation of this is readily found in the fact that with the present system of tile drainage and the excellent outlets thereto, water from such a rain is carried quickly from the fields and poured immediately into the upper courses of these streams, and the multiplication of these feeders has forced upon the streams a burden entirely beyond their present capacity. As a result the numerous floods have rendered thousands of acres of the best farming land of the State practically worthless. It will be easily seen that the responsibility for the improvement of the channels of these rivers rests equally upon the farm holders on the upper courses of these rivers with those located nearer their outlet. The principle of general assessment, so thoroughly recognized in legislation providing for drainage districts, can be applied with justice to these larger problems of reclamation which cover all land within individual drainage basins.



Cross Section Showing Two "Runs" of Cribbing.

Side Elevation of One Line of Supports.

FIG. 1. METHOD OF SUPPORTING AND MOVING A FIVE-STORY WAREHOUSE AT CHICAGO.

The methods used in making these drainage maps are very similar to those of the topographic branch of the U. S. Geological Survey, the principal difference being that because of the contour interval used, the enlarged scale, and the object of the work itself, a greater amount of detailed work is necessary. As bases for the maps the primary traverse transit lines of the U. S. Geological Survey are used for position and the primary level lines of the same survey for elevation, in addition to the steel tape measurements along township lines. With these lines for control, a plane table buggy traverse is run along the first ridge road outside the bottom on each side of the river, and as often as possible cross roads, which tie the work together, are run in the same way. Since the distance between roads crossing the river is so great, it has been found necessary, at intervals of from 1½ to 2 mi., to traverse from the outside roads to the river, where points are left for the purpose of being tied on by the stadia traverse of the river. While the wheel method of measurement may be considered crude and inaccurate, a practical test will prove, that for scales even longer than the one used in this work, and controlled equally well, it will fully meet all requirements. The accumulative error is slight, and when larger errors are made, they are readily located after the traverse has been tied to itself or to another line.

Over the same roads, and others when necessary, spirit levels are run and numerous elevations painted at summits, bridges, road corners and other convenient points, while at intervals scarcely exceeding a quarter mile, substantial bench marks are left. The level work is so planned that elevations determined by stadia need not be carried for distances greater than 1½ mi. Experience during the past summer indicates that levels may be successfully carried with this instrument for distances of 3 or 4 mi. The instrument is similar to the ordinary stadia, except that it is provided with an attachment which simplifies the reading of elevations at an angle. It has been in use on the U. S. Geological Survey the last few years, the idea for the improvement having originated with members of that survey.

The frame work of traverse and level lines, together with the stadia traverse of the river and other streams, is adjusted to the land lines and the other available control, after which it is ready for the topographer. This topographic sketching is by far the most difficult work connected with the making of a map, because of the necessity of carrying innumerable stadia lines through the dense jungles of the bottoms. Starting from convenient bench marks, these lines zigzag through the bottoms, the sight being through the openings of greatest length in the general directions of the traverse. The importance of these lines being closely run is clearly shown by a glance at the finished map, for the great number of lakes, sloughs, marshes and isolated hills are features that cannot be reliably mapped except by actual survey. Being hidden, as they are, by dense woods they must be hunted, and the meandering traverse line is the method by which they are found.

On the drainage maps, such features have been carefully traversed and their elevation determined, and in addition to the numerous cross sections at short intervals, a mass of isolated elevations have been left throughout the bottom lands. These stadia lines, as carried through the bottoms, are usually run with great difficulty because of the heavy undergrowth, and especially is this true in midsummer, when, in addition to the dense foliage, the intense heat and mosquitoes make work both difficult and disagreeable. In fact, because of this condition in the bottoms, the problem of keeping help is a very serious one, and the best solution seems to be in the bringing of help from such a distance that quitting at will is made more difficult. Few men will submit long to the physical sufferings met with in the bottoms, even at wages from two to three times the price they can receive elsewhere, if they are where they may reach home within a few hours.

Along with the stadia traverse and levels the relief of the river bottoms and the country adjoining the bottom lands has been carefully sketched. This map of the relief with 5-ft. contours should greatly facilitate the study of the river problem. Mere location of the stream course and elevations, be they ever so numerous, does not bring to the eye of the engineer the actual figuration of the surface. It is thought that it will be necessary to inspect most minutely the local physiographic conditions before a successful plan of improvement can be determined. It has been planned, therefore, to present to the engineer who studies this great problem the most complete possible data for his use. It is not claimed that this form of map is the most inexpensive one, even under the favorable conditions under which it was accomplished last season, but it is believed that in the end it will justify itself on the ground of economy in the saving of time and of additional work for the engineer. It also seems that in a study of the carrying capacity of the channel, the effect of possible dike construction and of the control of lateral streams, the topographic features of the map will appeal very strongly to the engineer.

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AN EXHIBITION OF TRACK APPLIANCES and machinery and tools used in railway construction and maintenance-of-way, is to be held in January at Calcutta, India. It will be in connection with the annual meeting of the Permanent-Way Institution of India, the secretary of which is Mr. Stuart A. Moncrieff, Harput, Meerut, India.

MOVING A LARGE BUILDING AT CHICA

The moving of a large warehouse b g is an interesting piece of work which has ac-complished in connection with the ter im-provements of the Chicago & Northwe Ry. at Chicago. The traffic of the Wells S sen-ger terminal is very heavy, but is thro at a short distance from the station by a dou track swing bridge over the north branch of Chicago River. This bridge is to be repla by a four-track bascule bridge of the Strau run-nion type, which is now under cons tion. The location of the two new main track the south of the present tracks) was block by a large warehouse, which structure h been moved to a new location so as to clear th ght-of-way.

The building is a substantial structure steel frame construction, with concrete floo and brick walls. It is 100 × 150 ft. in pla five stories high, and its estimated weight 6,000 tons. It has five rows of interior columns in one direction and eight rows in the opposite direction. After being raised by jacks sufficiently to clear the old foundations, underpinning was put beneath it and it was moved 50 ft. south and then 168 ft. east. Owing to its construction no temporary ties were required for the interior, such as are required when moving schools, churches or other buildings which have large rooms or chambers. At some of the columns carrying specially heavy loads, however, supports were fitted between the floors. These consisted of vertical timber posts with blocking on top and the bottom resting on screw jacks.

The underpinning consisted of needle beams and "shoes." The shoes were continuous longitudinal lines of timbers and I-beams extending in the direction of the travel. There were 16 of these for the eastward movement, three under each side wall and two for each row of interior columns. All the shoes were 12 × 12-in. timbers, except that the first and third at each wall were pairs of 12-in. I-beams. Upon the shoes rested the transverse needle-beams, which were short lengths of I-beams with blocking and wedges driven between them and the structure. There were three beams on either side of each column (six in all), forming with the shoes a rectangular frame around the foundation pier.

The supports of the structure during its movement consisted of "runs" or lines of cribbing, laid in the direction of the travel. For the eastward movement, there were 16 of these, one to each line of shoes. The ground was leveled and practically floored with 12 × 12-in. timbers laid transversely to the "runs." These latter were then built up like cribwork with six or seven rows of timbers 6 × 6 ins. The cribbing was leveled up to the exact height and grade by

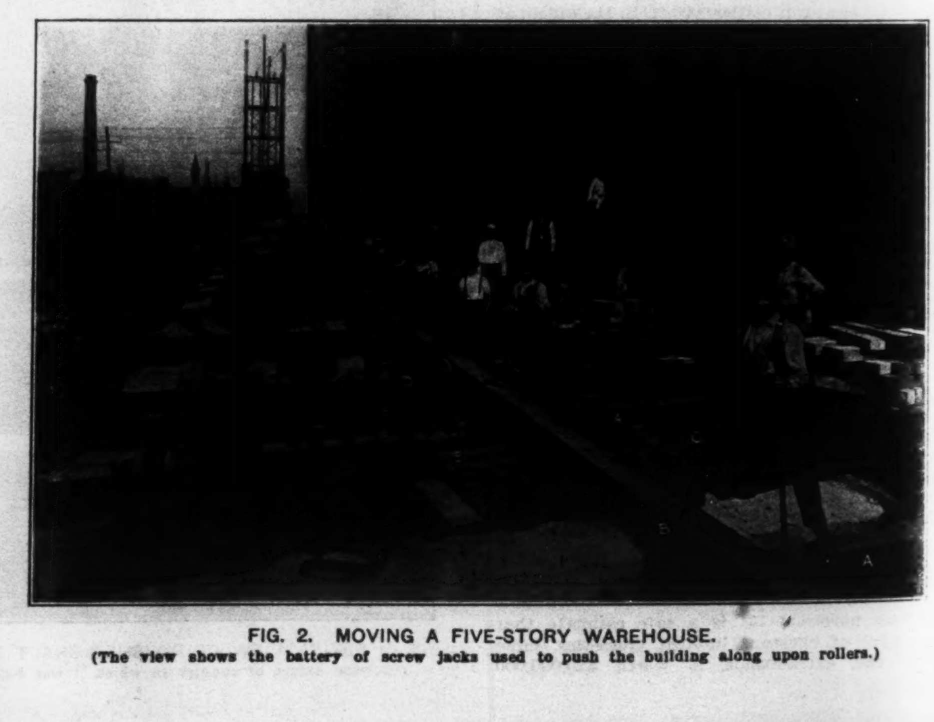

FIG. 2. MOVING A FIVE-STORY WAREHOUSE.

(The view shows the battery of screw jacks used to push the building along upon rollers.)

mean shingles used as shims, several thousand gles being used for the purpose. The top uilt up to about 1 in. above the requir rade to allow for settlement. The top row mbers formed ties for two lines of steel rail n which were laid the rollers.

T rollers were of 2-in. steel shafting, 18 ins. Between the rollers and the "shoes" whi arried the building were saddles, each con g of a flat plate resting on the rollers and wooden block upon this. There were abo 4 saddles to carry each of the 16 shoes, wit e rollers to each saddle as a rule. This giv total of nearly 2,000 rollers, or an average d of 3 tons per roller. The actual load var of course, the forward and rear rollers of h group being gradually loaded or released as saddle moved over them. For each "run" ther was a man to attend to the rollers; he straightened them into position with a hammer, and also removed each rear roller as it became fre nd set it in ahead of the group.

The building was moved by horizontal screw jacks of the type used in house moving. The butt ends of the jacks rested against the ends of the "shoes" mentioned above. The heads of the screws rested against heavy "pushing timbers" which were anchored by chains to the crib work of the "runs." In this way the weight of the building served to hold the anchorages. Fig. 1 shows the general arrangement of the supports, the underpinning and the jacks for moving the building.

There were 18 jacks, each of 30 tons capacity, and having a clear stroke or travel of 4 ft. The pitch of the thread was such as to require 8 complete turns for each 1-in. of advance. At each jack was a man having a bar with one end bent for convenience in fitting it to the hole in the head of the screw. The movement was directed by the man in charge (one of the members of the contracting firm) by means of a whistle. At each blast all the men moved their bars simultaneously, and then unshipped the bars and replaced them ready for the next blast. In this way the force was applied uniformly across the full width of the building.

The men being drilled to the work, the whistle was blown usually at intervals of only two or three seconds. When the screws had made their full travel, a series of sharp whistles notified the men. The cap nuts were then run up to the heads of the screws, and the screws thrust back into the hollow timbers. At the same time the anchor chains were shortened and the pushing timbers moved up against the heads of the screws. This required about ten minutes to make everything ready for the next move. The maximum move in one day was 36 ft., but an advance of 19 ft. 5 ins. was made in 3½ hours.

A view of the work in progress is shown in Fig. 2. At A, A are the screw jacks, fitted between the ends of the longitudinal shoes and the pushing timber B. At C is one of the anchor chains, with its rod connected to the pushing timber. The other end is carried some distance ahead and securely lashed to the blocking. The inclined timbers D are struts which were used temporarily to brace the pushing timber against the old foundation at its first move. At E, E, are the pairs of rails on which are laid the rollers under the building. This view shows the building being moved south from the present tracks at the left. It was then moved east towards the large storage warehouse shown beyond it.

The view shows also the old swing bridge (open) and the first double-track leaf of the new bascule bridge, which is being erected in an upright position. When this bridge is completed it will be put in service, the old swing bridge removed, and the second double-track leaf of the bascule bridge erected alongside (and on the left) of the one shown.

Great care and accuracy are required in work of this kind, to prevent damage to the building, and to maintain the proper line and elevation. A mark was made on each pier, and frequent levels were taken on these and on bench marks to ensure that the building was maintained level and at the right elevation. Plumb lines were hung at the corners. Small lateral movements of adjustment were effected by placing the rollers slightly diagonal to the lines of rails.

The moving of the warehouse above described was done by the firm of H. Sheeler & Co., of Chicago and Philadelphia. The firm makes a specialty of work of this kind, and has moved a number of large and important buildings, but the warehouse is one of the largest and heaviest buildings ever moved. The difficulties are, of course, much greater when the buildings have to be moved over considerable distances or on grades, and where they have to be turned around. On grades, very high blocking is sometimes required. The difficulties are also increased for buildings which have lofty towers or spires or which have large unsupported interior areas, such as churches and court-houses. Buildings of all kinds, however, have been successfully moved. Among the recent work done by Sheeler & Co. has been the raising of a large school building and other structures at Galveston, Tex. This was made necessary by the raising of the level of the entire city to an elevation considerably above that of the sea, in order to avoid a repetition of the serious floods resulting from storms in the Gulf of Mexico.

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THE WATERPROOFING OF THE LAND SECTIONS OF THE DETROIT RIVER TUNNEL.*

By STACEY H. OPDYKE.

The method of making tunnels waterproof is often an important feature in their construction. It is no longer thought sufficient that a tunnel driven below water level shall have (when completed) no more leakage than one or two pumps can conveniently discharge from the drainage sumps. It is now sometimes specified that a tunnel must be so completely and permanently tight that there will be no need of pumps, and that there must be no dampness or sign of water percolating through the wall. The means by which this result can best be accomplished is a matter of interest to engineers.

The Detroit River tunnel has land approaches partly in open cut and partly in tunnel. The tunnel portion is 3,675 ft. long on the Detroit side and 6,500 ft. long on the Windsor (Canada) side. Near the shore line on each side is a permanent shaft having a drainage sump to collect rain and surface water coming from the approach cuts. Each approach tunnel consists of a pair of single-track passages separated by a concrete wall. These tunnels are being driven through the clay with shields. They are lined with concrete and rendered waterproof by a complete envelope of coal-tar pitch and felt saturated with coal tar. This method of waterproofing is also applied to the permanent shafts.

The soil encountered throughout is a blue clay of nearly uniform character. The lower ends of the approach tunnels and the shafts are to all intents and purposes sub-aqueous work, as the rail base in the river section is 66 ft. (and the bottom of the drainage sumps 75 ft.) below water level.

The specifications under which the waterproofing is being carried on are given herewith.

SPECIFICATIONS FOR WATERPROOFING TUNNELS.

It is the purpose of these specifications to secure structures the interior of which shall be permanently free from moisture or discoloration due to the percolation of water, oils or other liquids from outside sources, by means of a continuous flexible waterproof sheet surrounding the exterior of the structure.

Coal-tar pitch of the grade known as "straight-run coal-tar pitch" shall be used, of a manufacture acceptable to the engineer.

Felt shall be dipped* in pitch and weigh not less than 15 lbs. per 100 sq. ft., and shall be subject to inspection and approval of the engineer.

Pitch when applied shall be of a temperature not less than 250° F. The surface upon which the waterproofing is applied shall be dry if practicable, in the opinion of the engineer. If it is impracticable to have such surface dry, then there shall be first laid a layer of felt of the quality above described, on the upper surface of which is to be spread the first layer of pitch. Said extra layer of felt shall not be counted as one of the layers of felt required by the plans or specifications.

None but competent workmen, specially skilled in work of this kind, shall be employed.

Until the waterproofing is covered, care must be taken not to break, tear or injure in any way the outer surface of the pitch.

Each layer of pitch, fluxed as directed by the engineer, must completely and entirely cover the surface on which it is spread without cracks or blow holes. The felt must be rolled out into the pitch while the latter is still hot, and pressed against it so as to insure its being completely stuck to the pitch over its entire surface. Great care must be taken that all joints in the felt are well broken, and that the ends of the rolls of the bottom layer are carried up on the inside of the layers on the sides, and those of the roof down on the outside of the layers on the sides so as to secure the full laps herein specified.

If considered necessary by the contractor or the engineer, because of the nature of the work requiring a rough handling of the waterproofing before placing in a final position, burlap shall be substituted for felt without extra charge. The burlap shall be of good quality, acceptable to the engineer, weighing not less than 8 oz. per sq. yd.

Any structure that is found to leak at any time prior to the completion of the entire work shall be cut out, and leaks stopped in a manner satisfactory to the engineer.

Class A waterproofing shall consist of 3 layers of felt and 4 layers of coal-tar pitch in alternation. Each strip or piece of felt shall be laid so as to lap 3 ins. upon the previous strip, and each section of waterproofing sheet shall lap at least 1 ft. with the adjoining section.

Class B waterproofing shall consist of 5 layers of felt and 6 layers of coal-tar pitch in alternation. Laps to be the same as for Class A.

Class C waterproofing shall consist of 10 layers of felt and 11 layers of coal-tar pitch, in alternation. Laps to be the same as for Class A.

Class D waterprofing shall consist of a swabbing of coal-tar pitch at least ⅛-in. thick.

It will be noted that these specifications call for four different classes of waterproofing. Class C is used where the water pressure is heavy, reaching a maximum of 75 ft. in depth. Class B is used for lighter pressure; Class A above the water level. Class D is used for coating the backs of the retaining walls of the approach cuts.

As a check on the quality of felt and pitch being used, representative samples of each shipment are regularly tested in the laboratories of the Detroit River Tunnel Co. The test on the felt is to determine the degree of saturation, the weight and the thickness. The pitch is tested for its consistency. Throughout the work the temperature of the pitch is not allowed to exceed 300° F. for any length of time. It is applied at such a temperature that little or no difficulty is experienced from the fumes when used under compressed air.

The approach tunnels on either side of the river are of practically the same character, and the construction in each case is being carried out

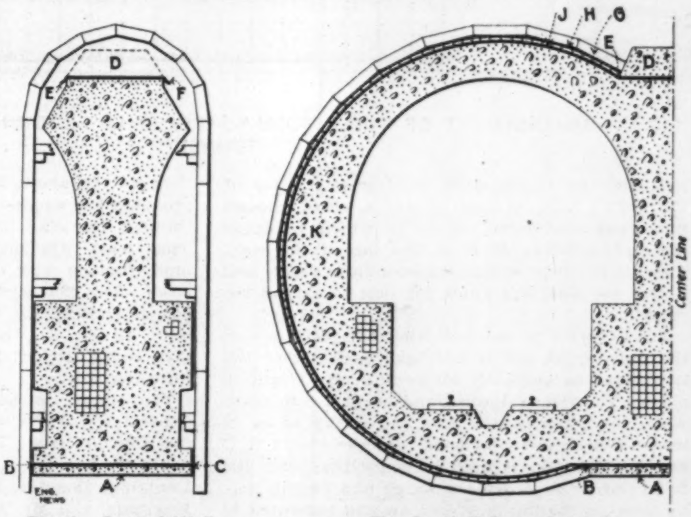

Fig. 1. Central Wall. Fig. 2. Half Cross-Section.

FIGS. 1 AND 2. METHODS EMPLOYED IN WATERPROOFING THE LAND SECTION OF THE DETROIT RIVER TUNNEL.

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*This article has been sent to us by the American Coal Products Co., 17 Battery Pl., New York, N. Y. In another column we describe some details of the work on the river section of the tunnel. The construction of the river and land sections was described in our issue of Oct. 31, 1907.

*Standard coal-tar saturated felt was approved of for use throughout, and the dipping or saturating was done at the factory.

in the same way. A shaft was sunk at the portal and from this shaft drifts 10 ft. wide and 25 ft. high were tunneled towards the river, the first part of the work being done without the use of a shield. A cross section of these drifts is shown in Fig. 1. As the drift was extended the walls were kept in place by timbering. Rough 10 × 10-in. uprights and cross bracing were used, as shown. For the roof the timbers were used in short lengths of about 30 ins., called cants. These were trimmed on a band saw to a template to fit the circle. These timber sections were built up in arch rings. As the excavation advanced, the center or core wall was built in this timbered drift. This wall divides the eastbound and westbound tunnels, and acts as a guide for the tunneling shields.

At the base of this center drift, a layer of concrete 4 ins. thick was placed as shown at A, Fig. 1. On this the waterproofing B C, was placed, the concrete serving as an outside protection course. The wall was then carried up, the cross timbers being cut away to make room for it, as shown. After the wall is built there remains an open space D between the top of the wall and the timber arch bracing at the top of the drift. This opening affords a clear, though somewhat contracted, space in which to apply the waterproofing E F to the top of the wall. The felt is cut in strips long enough to reach well across the wall and allow for laps to extend beyond it.

The concrete is mopped with hot pitch before the first ply of felt is laid, and each ply of felt is mopped before each succeeding ply is laid in place. The felt is applied and pressed into place while the pitch is still soft and sticky so as to insure a firm and solid bond. At the points B, C and E, F burlap is used in connection with the felt in order to provide a tough and flexible lap, as later on the lap is picked up and cemented in with the waterproofing on the arch and at the bottom.

After the drift for the center wall had been carried along for some distance, it was followed on either side by drifts dug by side shields as shown in Fig. 1. The shields use the center or core wall as a guide, steel channels being set in the concrete for this purpose. Behind the shields, the timber bracing, G, is placed to support the sides and roof. This timbering is as shown in Fig. 2 for the roof of the center drift. Each circle of blocks is wedged up tight against the preceding one so as to resist the thrust of the clay. The joints of the blocks are broken.

The inside of the timbering is lined with 1-in. plank sheathing, H, which forms the backing on which are placed the layers of coal-tar pitch and felt, J. The waterproofing at the base of the core wall at C (Figs. 1 and 2) is picked up and continued around the sheathing until it meets the waterproofing, F, at the top of the core wall. Nails and thin sheet iron strips about 1¼ ins. wide are used at frequent intervals to fasten the waterproofing to the sheathing, particularly on the roof. These strips are well swabbed with pitch after placing, and are covered by at least two plies of felt. The waterproofing is kept about 50 ft. behind the rear of the shields, this space being left to allow the excavators and timbermen to handle the spoil and the material. The felt is laid in strips of convenient length around the circle of the arch rather than parallel to its axis.

After the waterproofing has been applied to it, the board backing serves as the outside centering for the concrete lining, K. The inner centering is set up and the lining of concrete put in place as fast as the waterproofing is completed. As the concrete is tamped in solidly, the waterproofing has the same perfect bearing as if it had been applied after the concrete was in place. The waterproofing cannot be injured from the outside, as it is protected by the timbering.

DETAILS OF THE CONSTRUCTION OF THE DETROIT RIVER TUNNEL.

The railway tunnel now being built across the Detroit River is of exceptional interest from the fact that the river portion consists of twin single-track steel tubes which are sunk in place in a channel dredged in the river bed. This portion will be about 2,620 ft. in length. The approaches are single-track concrete tunnels driven through the clay by the aid of shields in the usual way. The methods of waterproofing these land tunnels are described elsewhere in this issue. The character of the work and the methods of sinking the tubes were described in our issue of Oct. 31, 1907, but we are now able to give some further details of this novel and interesting work.

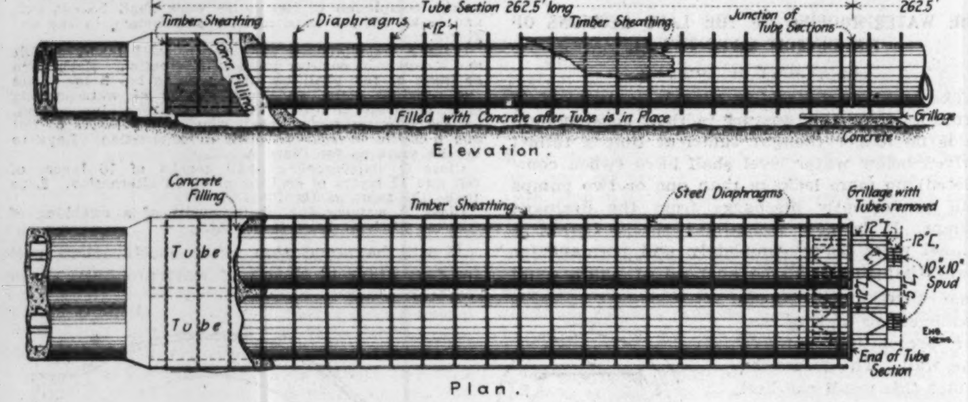


FIG. 1. ARRANGEMENT OF TUBES FORMING THE RIVER SECTION OF THE DETROIT RIVER TUNNEL.

The tunnel is being built for the Michigan Central Ry. by a separate organization termed the Detroit River Tunnel Co. Mr. W. S. Kinnear, M. Am. Soc. C. E., is Chief Engineer; Mr. Benjamin Douglas, M. Am. Soc. C. E., is Tunnel Engineer; and Mr. A. C Everham, Assoc. M. Am. Soc. C. E., is Assistant Tunnel Engineer. The contract for the entire work is held by the Butler Brothers Hoff Co., of Detroit.

The general construction of the river section is in brief as follows: The two parallel steel tubes are built in sections about 262 ft. 6 ins. long, being stiffened by steel plate diaphragms 12 ft. apart. The ends are closed temporarily by bulkheads, and timber sheathing is fastened to the ends of the diaphragms to form a hull. The structure is then launched, towed into place, and sunk by admitting water to the tubes. There will be ten of these 262½-ft. sections to complete the river crossing. Each section forms a complete structure with its two tubes connected by the diaphragms. Five of the ten sections have been placed, and the sixth is expected to be in place before the end of September. The land approach tunnels will not be completed until some time next year.

Before the structure forming a tube section is sunk, a deep channel is dredged in the river, so that the top of the tunnel will be somewhat below the river bed. At each junction of the sections, a steel and concrete grillage is set in place at the proper level in the bottom of this dredged channel. Thus when the tube section is sunk, its ends are seated upon solid sup while the middle portion is unsupported. n the structure is adjusted to exact positi ncrete is filled beneath and around the tubes, ing a monolithic concrete structure, in whi e two steel-lined tubes 23 ft. 4 ins. insid meter. This general construction is shown in 1. At the left is the junction with the concr nnels of the land approach, and part of th ncrete filling around the tubes is shown in e. At the right is the concrete and grillage b rming the support for the ends of the first second sections of the tubes.

The grillage is built up of 12-in. I-b s and channels, with angles for bracing and n. end channels. Stiffening diaphragms are d between the beams, and gusset plates a sed at the connections of the bracing angles. grillage is constructed with four 10 × 10 spuds (as indicated in Fig. 1). These are fo down into the clay until the grillage is at t proper elevation. They then serve as supports til the concrete is deposited beneath and betw n the beams.

JOINTS OF THE TUBES.—One of the special features of the work is the connecting of the tube sections by watertight joints. The joints are telescopic (Fig. 2). Each new section is guided into position by pilots which enter sockets on the section already placed. As soon as the new section is in place, bolts are put in to fasten the two sections together. The ends of the telescopic portion are closed by heavy rubber gaskets, leaving an annular space to be filled by grout pumped in through pipes.

For grouting the joint, two 2-in. pipes are tapped into the annular space; one of these enters at the top and the other at the bottom of the tube. The pipes are carried up above the level of the diaphragms, and have their ends threaded for attaching hose by which the grouting can be done from the concreting scow on the surface. We are informed, however, that as yet none of the joints have been grouted, and that this will be left until the work can be done from the inside of the tubes.

TUNNEL LINING.—When the tunnel is completed across the river, the tubes will be pumped out and the bulkheads removed. An interior concrete lining will be placed, 20 ins. thick in the arch, and forming side benches to receive the conduits for power, telegraph, telephone and signal cables. These benches will be 32 to 46 ins. wide at a height of 5 ft. 3 ins. above the rails, forming walks for the inspectors and workmen. The clear space for the cars will be 11 ft. 6 ins. wide. The concrete lining will be reinforced longitudinally by 1-in. round rods in the arch, and by rails in the vertical sides of the benches. The concrete is made with broken stone or gravel. The mixtures used are as follows: interior lining, 1:2:4; exterior filling around the tubes, 1:3:6; concrete base (below the steel diaphragms), 1:4½:7. The concrete and the steel shell with grouted joints are relied upon to make the tunnel watertight. The drawings of the completed work are shown in Fig. 3.

The floor and track construction are of peculiar design. In the middle of the concrete floor will be a drain with the bottom 2 ft. below top of rail at changes of grade, increasing to 2 ft. 6 ins. at the sump. On each side of this will be recesses for wooden blocks to carry the rails. Every fifth block on the right-hand side will be of extra length to carry a support for the third-ra conductor. This will be a 70-lb. rail on the under-running system.

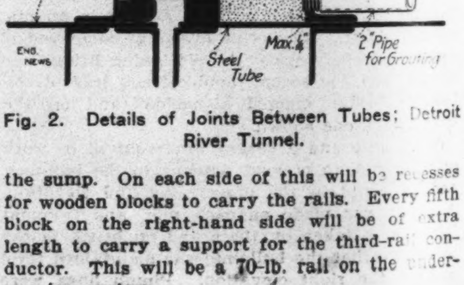


Fig. 2. Details of Joints Between Tubes; Detroit River Tunnel.

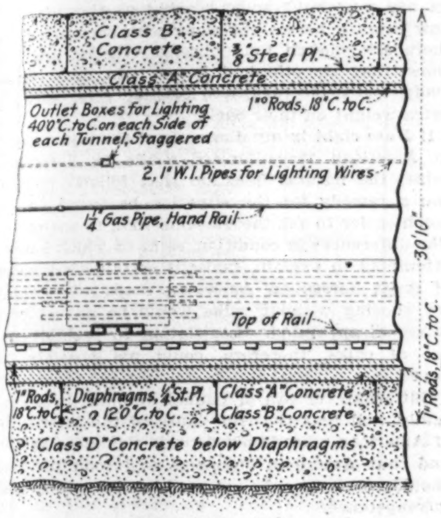
CONCERNING ROADS, ENGLISH AND AMERICAN. A CONTRAST AND ITS EXPLANATION.

[Editorial Correspondence.]

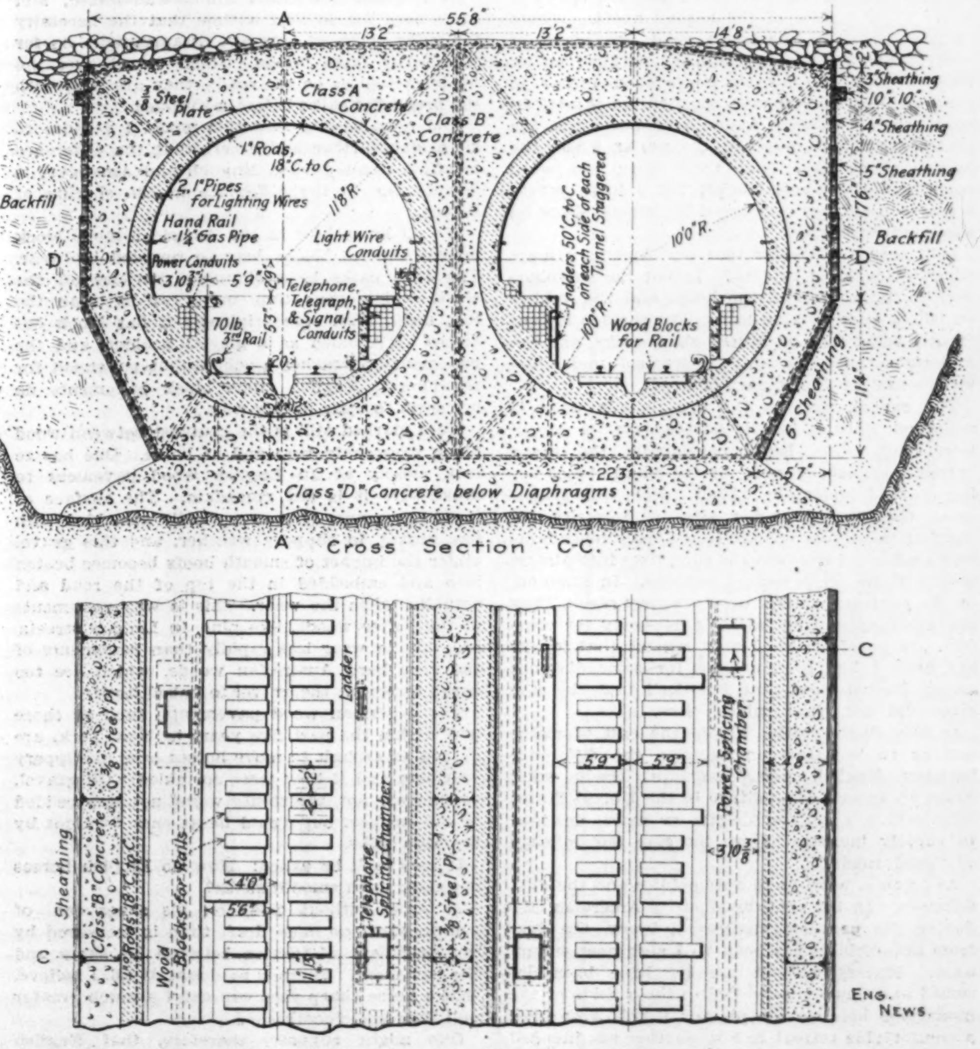
The excellence of English roads, and, indeed of European roads generally, has been told by so many travelers that it may seem like an old story. Yet as the praise of English roads is usually—and quite naturally—coupled with condemnation of American roads, I have thought it worth while to carry the comparison a step farther and inquire some of the reasons for the contrast.

And the contrast I am referring to does not lie in the fact that *all* the public roads in England are macadamized, whereas in the United States we have made only a bare beginning on a few highways near the Eastern cities. What I am contrasting is the macadamized roads as one sees them here in England and the macadamized roads in the United States.

Why is the English road so much better; or, to put the question the other way, why are our American roads—the best that we can show in New Jersey or New York, or Massachusetts—so much inferior to the roads of England?


Class B Concrete
3/8 Steel Pl.
Class "A" Concrete
Outlet Boxes for Lighting 400'C. to C. on each Side of each Tunnel, Staggered
1" Rods, 18" C. to C.
2, 1" W. I. Pipes for Lighting Wires
1¼ Gas Pipe, Hand Rail
30'10"
Top of Rail
1" Rods, 18" C. to C.
1" Rods, 18" C. to C.
Diaphragms, ¼ St. Pl. 12'0" C. to C.
Class "A" Concrete
Class "B" Concrete
Class "D" Concrete below Diaphragms

Section A-A.


A
55'8"
13'2"
13'2"
14'8"
3/8 Steel Plate
Class "A" Concrete
Class "B" Concrete
1" Rods, 18" C. to C.
2, 1" Pipes for Lighting Wires
Hand Rail 1½ Gas Pipe
Power Conduits
3'10¾
5'9"
11'8" R.
Light Wire Conduits
Telephone, Telegraph, & Signal Conduits
70 lb. 3rd Rail
5'3"
20"
Backfill
D
Ladders 50' C. to C. on each Side of each Tunnel Staggered
10'0" R.
10'0" R.
Wood Blocks for Rail
3" Sheathing
10" x 10"
4" Sheathing
5" Sheathing
17'6"
Backfill
D
6" Sheathing
11'4"
22'3"
5'7"
Class "D" Concrete below Diaphragms
A
Cross Section C-C.
C
C
Sheathing
Class "B" Concrete
1" Rods 18" C. to C.
3/8 Steel Pl.
Wood Blocks for Rails
4'0"
5'6"
2'10½
11'5½
Ladder
Telephone Splicing Chamber
3/8 Steel Pl.
5'9"
5'9"
Power Splicing Chamber
4'8"
3'10¾
Eng. News.

Sectional Plan D-D.

FIG. 3. THE RIVER SECTION OF THE DETROIT RIVER TUNNEL.

That the British road *is* better, and vastly better, will surely not be denied by any competent judge who compares the two. To specify more particularly, the surface of a macadam road as one sees it here in England is smooth and hard. In good weather that is neither very dry nor rainy, an English road is almost as hard and clean as a brick or stone pavement. In dry weather it has very little dust upon it and in wet weather very little mud. Loose stones, large or small, scattered over the surface, are rarely seen in English roads. The traction resistance on them can be little more than on a block pavement.

I have examined in the past month a great many roads in widely different parts of England, Scotland and Wales. Comparing them with the roads in New Jersey, made with hard trap rock, with which I have been for many years familiar, I believe the New Jersey roads subjected to equal traffic will have five to ten times as much dust upon them at the end of, say, a week of dry weather as would be found on an English road. It is nothing uncommon to see dust like fine flour a considerable fraction of an inch in depth on our New Jersey roads. When rain comes this dust is promptly converted into mud.

These English roads, however, do not act in this way at all. They seem to resist the wear in a wholly different way. One sees the stones showing in these road surfaces, often of considerable size, but the binder between the stones seems almost as hard as the stones themselves.

A good illustration of the difference between the two road surfaces is the fact that these English roads can be and are swept, and with stiff rattan brooms, and that, too, in wet weather when their surface would naturally be softest. On our American macadam roads, street cleaning, or at least street sweeping, is practically unknown. If it were attempted, with any such brooms as are used here, the macadam surface itself would be torn up by the brooms. Still further I may note that not only hand brooms but rotary horse sweepers are regularly used on these English macadam roads, and they work admirably. If any one is able to use horse sweepers on an American macadam road, I have never heard of it.

And because this English macadam surface is so resistant to wear, it is used as a city pavement on streets of heavy traffic, where, under American conditions, nothing but stone or brick or wood paving would be considered suitable. To draw the contrast again: In my own home town of Montclair, N. J., a suburban residence town of less than 20,000 population, and no manufacturing industry, ordinary macadam is being abandoned as a paving on the main streets. It creates so much dust and so much mud and requires resurfacing at such frequent intervals that one of the proprietary tar macadams is being substituted for it. Yet here in England I find industrial cities of 50,000 to 60,000 inhabitants, with the traffic compressed into narrow streets not half the width of the main avenue in Montclair, which I have referred to, and many of these main business streets are improved with nothing but macadam. There is no mud and no dust—or at least none according to our American standards.

Surely this contrast is one that ought to make American engineers "sit up and take notice."

Why are our roads so unsuccessful compared with those of the older country, or rather, again to reverse the question, what make English roads so much better? I know well the conclusion reached by most Americans who travel abroad and notice this contrast. It is the very natural conclusion that American engineers do not yet know how to build good macadamized roads.

Now, we will all admit, of course, that not a few mistakes have been made in our first essays at good road construction in the United States, and it is true, too, that in many quarters contractors and workmen who are experienced in macadam road work and know how to do it right are hard to find. An engineer cannot always stand over a piece of work from start to finish to see that it is done in the right way.

I do not believe, however, that the great contrast between the roads of the two countries is due to ignorance of the art of road building in America. For that matter some of the best known road engineers in the United States have had English training and experience.

We cannot lay the difference, either, to difference in the materials. In both countries a great variety of materials is used for road building. American traps and granites and other hard stones are quite as resistant to wear as the similar stones used for roadmaking in England.

Something may perhaps be allowed for the beneficial influence of English weather. A climate where the sun's rays are not scorching, even in midsummer, where frequent gentle rains are the rule and long droughts and heavy drenching storms with accompanying wash the rare exception, and where the frost never penetrates the ground more than a few inches is certainly an ideal one for the road builder. And yet I cannot believe that the climate alone chiefly deserves the credit for the excellence of English roads.

I believe, from all the information I have been able to obtain, that the difference in wearing qualities, in dust and in mud of English and American macadam roads is due almost wholly to one very simple cause, which, so far as I am aware, has never before been pointed out. I believe the whole explanation of the mystery lies in the fact that *American horses are shod with sharp calks, while English horses are smooth shod.*

I make this statement broadly, and proceed at once to note the qualifications. I am aware that some few horses in the United States in sections where most of the roads are macadamized are smooth shod; yet even there shoeing with calks is the rule. I am aware, too, that in England the heavy draft horses are often shod with huge blunt calks. These calks are so broad and flat, however, that they do not penetrate the pavement at all, and apparently they are purposely so made. Again, in icy weather in winter English horses have calks put on their shoes; but when the road is thus covered with ice, its surface is protected from the calks, and being frozen, it is more resistant to penetration anyway.

Everyone has seen how an ordinary footpath of clay will, under the constant tread of feet, become almost as hard as stone. Exactly the same thing, I believe, happens to an English roadway under the influence of the horses' hoofs. Where on an American macadam road the hoofs of every passing horse tear up the surface, on an English road the horse's hoofs tend rather to compact it. One always sees on an American road, where carriages follow a beaten track, the surface torn and rough in the center where the horse's shoes have done their work and worn smooth in the wheel tracks; but I have yet to see a road surface roughened by horses' shoes on any road in England.

Is it really a wonder that our American macadam roads wear rapidly? Is not the combination of the road, and the horse and the vehicle an efficient pulverizing mill? The surface is constantly being torn up by the sharp calks, and the materials thus dug up are crushed under the wheels and by the impact of hoofs.

The ear as well as the eye records what is going on when a vehicle passes over an American road. One hears continually the sharp "crunch, crunch, crunch" of the small stones being crushed under the wheels. It is this principally that makes rubber tires a necessity for comfort in driving on our New Jersey macadamized roads, and has brought such tires into almost universal use on passenger vehicles. In England, on the contrary, rubber tires are very rare. They are a luxury and not at all a necessity for comfort. In proof of this I may remark that it was not until I had been driving for some distance on an English road that I noticed that the carriage did not have rubber tires.

In this single matter alone—the cost of maintaining rubber tires on vehicles—the difference between English and American roads must cause an annual expenditure in the United States approaching a million dollars or more, destined to rapidly increase as we increase our mileage of "good roads."

And now a word as to automobiles and the dust nuisance. In the suburbs of every American city during the past hot summer, I know, the dust from automobiles has been well nigh past endurance. Houses without number have been deserted and families have fled to the seaside or the mountains because the piazzas which were once a comfortable retreat in hot weather are invaded by a cloud of dust raised by each machine that passes; and living indoors with closed windows in an American summer is nearly or quite impossible. A great deal more could be said on this subject and yet the story would not be half told, but the situation may be summed up by a guess that the depreciation in the value of suburban residence property in the United States on account of dust from automobiles must amount to many million dollars.

So much for our own country. How is it here? I had read much in the English engineering journals concerning the difficulties of a similar sort that are being experienced here; but I am astonished to find that, measured by our American standards, there is no dust nuisance at all here. One sees automobiles in plenty, and where there is any dust in the road, of course, one sees the familiar little fountain of dust sucked up at the back of each tire; but the amount of dust on the roads is so trifling that there is no great dust cloud raised such as commonly follows the autos at home. In fact, I have yet to see a dust cloud raised by an automobile here that I cannot match with the dust raised by an ordinary one-horse delivery wagon on the streets of my own home town.

I have read in the English papers, too, of the injury being done to roads by automobile tires; but I am convinced that we in America have the only real thing in that line. The binder in these English roads is too hard and firm for the tires to tear it out and ravel the road to pieces as is happening all the time on every yard of road at home.

All this, and more, is the price we are paying in the United States for following the custom of putting sharp calks on horse shoes. It is a custom without doubt, which has grown out of the former universal prevalence of dirt roads, where calks are essential to give a horse a sure foothold at all times.

In England *all* roads are macadamized, and have been for so long a time that the necessity for calks on shoes long ago disappeared. As for the heavy farm horses, which travel over the fields as well as on the roads, they are shod with the broad flat calks before mentioned.

And now, having said this much, I venture to go a step farther and assert that the difference in other street paving, English and American, is largely due to the difference in the shoeing of horses.

We all know how in our American stone block pavements the blocks become rounded by wear. The shoe calks keep chipping particles off the sides, which wear thus more rapidly than the top, until what was originally a flat block becomes as rounded as a glacial boulder, and the pavement approaches a cobblestone pavement for roughness. English stone block pavements do not seem to wear in this way.

More marked still is the contrast between wood block pavements here and at home. One has to look closely at an English wood pavement to make sure it is not macadam. The surface of these pavements is systematically sprinkled with fine gravel, in slippery weather, and this gravel under the impact of smooth hoofs becomes beaten into and embedded in the top of the road and actually takes the wear. This is why pavements of the softer woods, like pine, in London streets, are said to wear less rapidly than pavements of the very hard Australian woods, which are too dense to permit the gravel to imbed itself.

Our American wood pavements, such as those laid within the past five years in New York, are as bad as asphalt to move horses over in slippery weather; and if they were sprinkled with gravel, as they are not, the stones would not stay bedded in the surface, but would be at once torn out by the shoe calks.

It may well be asked: How do English horses get along with smooth shoes?

A horse without calks on his shoes can, of course, exert no more draft than is measured by the coefficient of friction between his shoes and the pavement. There is no doubt at all, I believe, that a horse sharp shod can exert a much greater pull than one smooth shod.

One might suppose, therefore, that English smooth-shod horses would draw lighter loads than American horses, but I am not at all sure that this is the case. A horse cannot exert for any considerable time a pull great enough to make his shoes slip on a macadam surface. Further than this, while an American horse smooth shod would be certain to slip, since he has always been accustomed to rely on his shoe calks to hold him, an English horse having always been smooth shod never appears to slip. He instinctively knows how to place his weight so as not to slip his feet. I have seen English horses tugging a coach up a hill rise on their toes, and I have even seen them do the same thing coming down hill with a cart, just as a man digs his heels in the turf in descending a slippery slope.

Still further it is to be noted that steep hills are very rare on these English roads, and also that four-wheeled vehicles are almost always ipped with brakes, and these brakes are used light down grades where drivers would never nk of applying them in America.

And besides these things, England is t ountry of the two-wheeled cart, a vehicle a st as extinct in the United States as the war ariot of antiquity, which was its prototype. W there should be this difference in the custom of two countries one can only surmise. It n t be thought that in the United States, wher orses flounder through mud on country roads uring part of the year, it was found advanta s to remove all load from the horse's back. E English horses also floundered through mud oads until the good roads era began early in t nineteenth century.

This much, however, is clear, that th horse drawing a two-wheeled vehicle and carryi part of its weight on his back, can pull m on smooth shoes than a horse with only h own weight on his "driving wheels." I cannot lieve that the two-wheeled cart is as efficient a ansportation vehicle as the four-wheeled wag and the probability is strong that its use re is merely adherence to old-time custom. An while its use may have some bearing on the question how English horses get along with smooth hoes, there are enough four-wheeled vehicles here to show that smooth-shod horses can draw good loads, *under the conditions existing here*, without extra weight on their back.

If I am right in my diagnosis of the injury done to American macadamized roads by horseshoe calks, the natural question that follows is how can a remedy for the situation be found. It is much easier to ask the question than to answer it. The differences in condition, some of which I have attempted to explain, make it certain that users of draft horses on American roads who might try shoeing without calks would be almost certainly disappointed. Legislation to prohibit the use of calks, therefore, could not possibly be hoped for.

But whatever can or cannot be done, it is certainly well that the true cause of the inferiority of American macadamized roads should be known and that American engineers and road builders should no longer be accused of ignorance and incompetence.

C. W. B.

Oxford, Sept. 4, 1908.

◆

THE RIFLED OIL PIPE LINE of the Southern Pacific Co. in the San Joaquin valley, California, described by Mr. J. D. Isaacs, one of its inventors, in Eng. News, June 7, 1906, p. 640, is now in operation for a length of 120 miles. It is to be extended to nearly 300 miles. Reports state it to be entirely successful, with a movement of 17,000 barrels per day (8-in. pipe). There are eight pumping-stations on the line. The water which is pumped in forms an outer skin about ⅛-in. thick at the beginning and thicker farther along the line, the oil staying in the interior, due to centrifugal action (as in cream separators). The line terminates at Port Costa, on Carquinez Straits.

◆

A BOW RUDDER FOR STEAMERS has been designed for the purpose of giving greater steering power for river steamers and other vessels of light draft when going astern. It does not interfere with the shape or construction of the hull, and it can be put in position for use very readily or removed when the vessel is ready to move ahead. The rudder slides on a vertical post or guide which is fitted permanently just in front of the stem post or bow, and this forms the pivot or shaft of the rudder. The rudder is raised or lowered on this shaft by means of tackle carried by an arm above the bow. When raised, it is swung back so that it lies flat against the side of the hull, above the water. When lowered, a steering tiller is fitted to the head of the pivot shaft. This device is the invention of Mr. Alfred F. Yarrow, of the noted English shipbuilding firm of Yarrow & Co., Glasgow, Scotland, which makes a specialty of light draft steamers for naval and commercial service in all parts of the world. The steamers of American rivers are fitted very frequently with three or four balanced rudders at the stern, all operated as one unit. The blade extends both forward and aft of the shaft. This management gives better manoeuvring facilities than the ordinary form of rudder, but these facilities may be increased materially by a rudder at the bow when the vessel is moving stern first.

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All users of chestnut lumber and timber, and all lovers of handsome trees, to say nothing of the young in fact or in spirit who delight in one of our most toothsome nuts, will be interested in the article on "The Chestnut Bark Disease," by Mr. E. A. Sterling, Forester of the Pennsylvania R. R. Co., which we present elsewhere in this issue. It is only necessary for us to say here that the chestnut tree seems doomed to virtual extinction, to call attention to Mr. Sterling's review of its importance in our trade and industry, and to urge that every menace to our fast diminishing forests, be the menace by nature or by man, points unerringly to the need of extensive and intelligent forestry work in the United States on the part of the nation, each state and every competent individual.

◆

In contrast to the work of reconstructing the famous Campanile of St. Mark's, at Venice, which collapsed about six years ago after over a thousand years' existence, it is interesting to observe that in the near future the first skeleton skyscraper built in New York City is to be removed to make way for a larger building, although only twenty years have passed since it was built. Upon the basis of two such typical cases, it is small wonder that the European engineer so prides himself upon the permanence of his own construction, and criticizes his American brother for the ephemeral nature of his work, but that such pride sometimes leads to ludicrous ends is quite as true as that such criticism is generally unjust. As an instance of the limits to which this worship of the permanent may lead, we would quote, with our own italicizing, the following possible causes for the collapse of the Campanile, as stated by the author of the paper from which the article on another page of this issue was taken. These three possible causes are: disintegration of the material, the repeated effects of earthquakes, or *faults in construction*. The first two of these would seem to be ample explanation of the disaster, but it is hardly professional courtesy to drag in the architect, a contemporary of Columbus, who built the latest Campanile there in the Place St. Mark, or those artisans who, back in the sixth century, laid the foundations which even now have been utilized in the construction of the new tower. Four centuries of undisturbed existence ought certainly to be proof of correct design and construction, even to the conservative European engineer, who regards our occasional century-old bridges and buildings as mere novelties, not yet tested by time.

◆

The accuracy of modern construction surveys, which permit the joining of tunnels and bridges well within the limits of alinement and material if not within the few thousandths of an inch frequently described in the daily press, gives a certain prominence to the following unauthenticated dispatch from Germany:

> REVENGE COST $875,000.
>
> Heidelberg, Sept. 12.—It was discovered that the two sections of the tunnel being constructed by the Government in the Black Forest Mountains, which should come together at the village of Forbach, miss each other by 26 ft. A mistake in the survey had been caused by the misplacing of a surveying pin, the act of a discharged laborer. It will cost $875,000 to repair the error.

Until better attested than at present the occurrence of so large an error is certainly to be doubted. European engineers, especially those engaged in tunnel practice, are experts from training and experience on the mathematical niceties of higher surveying. That they should have neglected the customary checks in either the preliminary triangulation or the subsequent alinement is incredible. And the single displacement of one pin, for spite or in ignorance, might disarrange the whole system in a freshman campus survey but in a tunnel bore, properly controlled, one misplaced mark could hardly escape detection.

A correspondent forwarded us this clipping with the suggestion that we make it the text for a recommendation for more thorough check systems in all surveying. With the doubtful information at hand further discussion of the incident seems uncalled for. We note the matter, however, largely on account of the "human interest" furnished by the caption writer.

◆

The reinforced-concrete mine-shaft which the Lackawanna R. R. has sunk at its colliery near Wilkesbarre has been given wide publicity as a very present example of the effort toward conserving our natural resources, which received so great an impetus at the conference of the governors last spring. The shaft in question is not the result of the work of that conference, for it was nearly completed before the presidential message calling the meeting, but had it been so intended it could not have better served the purpose of illustrating not only the necessity for more scientific development of the great riches stored up in the land but also the past wastefulness in that development. However, these latter truths are now self-evident and appreciated by the people since they were so forcibly stated by the various speakers last spring. The Wilkesbarre shaft is more interesting as an indication of the timeliness of the present conservation movement and an example of the possibilities of the future under the more advanced knowledge of engineering science.

Wastefulness in the past was not entirely due to a disregard of the possible limited supply, although the seeming abundance of treasure precluded any great amount of worry over the future. But the state of the art was such that many improvements now evident were thought impossible or not thought of at all. Time was when the coal of Pennsylvania was so easy of access that no great expenditure was required to get it to an eager market. Time is when capital investments, undreamed of in the past, gain reasonable profit on account of more scientific methods which permit of greater earnings. That is why the movement toward conservation stands a better chance of success now than it would have a half century ago. Aside from the more evident proximity of the exhaustion point in resources the technical standards of to-day have reached a period when things can be done economically which in the last century could not be done at all. The sinking of a concrete shaft, such as is described elsewhere in this issue, opens up a coal field practically inaccessible under the cruder methods of the past. Such an undertaking might have been accomplished in 1860, but it is highly improbable, and the cost would have been prohibitive.

◆

It is hoped that the recent aeroplane accident at Fort Myer, Va., has only temporarily halted the interesting and instructive work, in this country, of the Wright Brothers. The last performance, at Le Mans, of a duplicate of the machine wrecked at Fort Myer, sustains such hopes. The death of Lieutenant Selfridge comes with additional shock because of his promising career and because of the uniform and spectacular success that had previously accompanied the Fort Myer trials. The sequence of the series of remarkable flights and their sudden and tragic end have aroused much speculation as to the bearing of the events on the inherent limitations of human flight by "heavier-than-air" machines. Long-sustained mechanical flight is a certainty. Is it to be more dangerous than ballooning? Is the static equilibrium of a balloon more reliable than the dynamic reactions on which the aeroplane depends?

Shall the aeroplane be sailed close to the earth or hundreds of feet above? Is it more desirable to have a greater distance of fall in which to recover control in case of accident than to have a short fall without chance of resuming control? Must the safety of flight depend solely on the cool head and quick hand of the pilot? Are automatic transitions possible from swift flight to easy descent? Can the vibration of an explosion motor set up synchronous vibrations in a highly-strung frame that become dangerous through added stresses or through interference by amplitude of motion? Does the operator of an aeroplane lose the ability to glide to earth during a turn or in describing a curve? These are some of the more notable queries heard on all sides, and to which the actions of the Wright machine may give some reply. It is to be hoped that those who may be enabled to study this accident will give some answer to such questions.

The name of Lieutenant Selfridge is the fourth placed on the list of martyrs to the art of human flight. The first recorded is that of Otto Lilienthal, in 1896, who is remembered as the originator of the ideas of bird flight that have resulted in the Wright flyer. The second name is that of Lieut. Percy S. Pilcher, a young Englishman who followed Lilienthal's ideas and produced a kite which would carry him if pulled against the wind. The third name is that of one Maloney, who made descents for Prof. J. J. Montgomery, of Berkeley, Cal., from a balloon by an aeroplane apparatus. The first descents were successful, but soon the apparatus collapsed at a high altitude. This list is shorter than the one which accompanies an equal advance in ballooning and one has but to turn back to the rather meager records that are easily accessible to find the tragedies of De Rosier, 1785, Zambeccari, 1812; both men who attempted to heat their hydrogen. It is recorded that many Frenchmen, whose names have been lost, have been killed, at different times, by suffocation or by arsenic in the gas used. A German, Wölfert, and a companion were killed by the explosion of their dirigible in 1897. In 1902 a Brazilian, Severo, was similarly killed with his companion. In this same year many investigators lost their lives, among them Capt. von Sigsfeld, of the Prussian balloon corps, at Antwerp, Baron von Bradsky, at Paris, and still another, a French naval officer, whose name has escaped, was thrown from his balloon at Lagoubran and drowned. The most recent disaster that comes to mind is the one in which C. O. Jones, a companion of Lieutenant Selfridge in many experiments, was killed in Connecticut, during an exhibition of a dirigible balloon. These incomplete records seem to reassure us of the safety of mechanical flight compared with ballooning.

Mr. Wright's testimony, since the Fort Myer mishap, has been in favor of high flights that the aeroplane may be directed to a gliding descent for landing in case of trouble. It is to be inferred that, of course, only low flights are attempted until it is known what characteristics each machine possesses. As far as present developments have been carried it looks as though automatic gliding in case of loss of motive power or slight disablement had not been obtained. If safety then does depend on quickness of human action it would seem that high flights were advantageous when it was once determined how a machine would respond to certain influences.

Mr. Wright's assistants have been quoted as saying that this aeroplane, in describing a curved path, could not recover its equilibrium and safely glide to earth should the motive power be removed. This sounds like admitting a defect in design which we are unwilling to believe exists, although it may be true that at the present state of the art such a recovery is not automatic and that if the pilot is hampered the machine may fall to swift destruction.

It is Mr. Wright's own testimony on this accident that a propeller blade broke by contact and interference with a rudder guy. The natural inference is that this guy had been tightened until it vibrated, with increasing amplitude and strength, in synchronism with the vibration set up by the engine. Whether the guy was over-stressed before or after contact has not been decided. But it makes little difference either way, as the action has been shown to require attention, after a machine has been assembled.

We believe that this accident will shed some light on the limitations of mechanical flight and certain necessities in the design of these machines. While the cost may well be reckoned excessive yet the sacrifice has not been useless.

THE PROBLEM OF THE CHICAGO ELEVATED RAILWAY LOOP.

When the first three Chicago elevated railways were built, each had its own stub or dead-end terminal station, and these three stations were all outside of the business center. Later the Union Loop was projected and built with the special object of carrying the trains of all these lines through the business district. Soon after its completion a fourth elevated line was connected with it. The loop forms a rectangle, with each side covering five city blocks, and it has eleven stations in this short distance. The stub terminals were abandoned for train service, two being used for car storage and one of them being pulled down. There are junctions at three corners of the loop, and at each of these the trains of one line must cross the tracks of another line in entering and leaving the loop. Two of the four lines run their trains left-handed (beyond the loop) in order to simplify the junction arrangement, but even this does not avoid the grade crossings.

This loop arrangement proved satisfactory until the number of trains increased to such an extent that during the "rush" hours the movement became intolerably slow. The number of trains has been increased not only by the growth of traffic but also by the opening of branch lines, the trains of all of which are run to the loop. The trains are so crowded that it would be impracticable to run the branch trains only upon their respective branches. Apart from the desirability of avoiding changes of this kind, as noted above, passengers from the branch trains could not find accommodation in the through trains (for the loop), and there would be continual confusion and delay.

Under the present conditions, the normal movement on the loop during the "rush" hours is very slow, and any slight delay at a station or a junction point blocks the traffic until there may be a long line of trains close together. These trains crawl along slowly and intermittently. If the blockade fouls any of the junctions where trains enter and leave the loop, the interference with traffic may quickly become serious. With a track blocked beyond one of these junctions, as by an open drawbridge (and there are two such bridges close to the loop), trains destined to leave the loop at that point have to be run around the loop again (until the junction outlet is clear) in order to avoid blocking all other traffic.

A radical means of improvement which has been recommended by engineers engaged by the city to investigate the matter is to adopt through routes over some of the lines. This would avoid the present arrangement by which every train must pass entirely around the loop. Thus trains from a northern line entering at one corner wou'd pass around only two sides of the loop and then leave it at a diagonally opposite corner, continuing their course over a southern line. The trains of the latter would run over the northern line in the same way. This plan of utilizing the loop as a link in a through route, instead of as a terminal, would undoubtedly reduce congestion of traffic. While it would involve change of cars to reach stations on the other sides of the loop, the conditions are such that it seems impossible to give passengers both rapidity and completeness of service in combination. The railways are owned by separate companies, however, and the companies show no disposition to arrange for such a mutual interchange of traffic.

Some slight relief is being afforded by reverting to the use of three stub terminals outside of the loop. One of the first of these original terminals was pulled down, as noted above, after the loop connection was made. This has been rebuilt in another location in order to accommodate some of the trains of the elevated railway and also the trains of an interurban line which enters Chicago over this one of the elevated railways. One of the latest developments is the construction of a fourth stub terminal (also outside of the loop) in order to relieve the congestion. This use of such outside "stub" terminals in connection with a loop is open to many objections, however necessary the plan may be to relieve existing conditions temporarily in this particular case. One of these objections is the impossibility of confining the "stub" trains to passengers who would be served conveniently by them. This results either in a change of cars (at a time of great crowding in the trains and on the platforms), or in landing a proportion of the passengers at a point which is not within convenient reach of their destinations.

The Chicago elevated loop is a striking example of the effects of concentrating upon one loop all the traffic from several lines. The congestion of traffic on the loop, due to this concentration of trains, has been a serious matter for some years, and is becoming worse with the continual growth of traffic. Passengers are landed at convenient points, it is true, but the train movement is so slow that much valuable time is lost, and passengers must allow an ample margin if they desire to reach a given point at any certain time. More important still is the fact that as the loop, comprising only two independent lines of track, must carry the traffic of four lines, it is impossible to work the four lines to their full capacity. The constant attempt to do so has no other result than to congest the loop and really lower the capacity of the system.

Various remedial plans have been suggested, but, no definite steps have been taken, nor does such action seem probable. The elevated loop structure itself has always been objected to by some property owners and others, and the abandonment and removal of the structure has been advocated as a concomitant part of the subway scheme which is now in the nebulous stage of its development. As the subway scheme is intended primarily for the relief of street traffic by putting the street cars underground, it is open to question whether the elevated railway trains in addition could be accommodated with any improvement in the operating conditions. At any rate, such a change is not a matter for the immediate future, and in the meantime some real improvement upon present conditions is urgently needed. With the great number of trains and the enormous traffic of the various elevated railways, two serious and closely-related problems face the operating officers of these lines and the union loop: (1) how to handle the traffic promptly and efficiently; (2) how to deliver and receive the greatest number of passengers at points convenient to their places of business.

To begin with the second one, the convenience of the terminals: The time has gone by when it could be considered satisfactory to send either the urban rapid-transit traffic or the suburban commuting traffic in a belt outside the central district. The central district has its own difficult transportation problems, and (principally because of the growth of high buildings) these problems are serious enough without being complicated by the task of rehandling and distributing the dense traffic of rapid-transit and suburban lines. This state of affairs was briefly discussed by us in our issue of Sept. [illegible], though from a slightly different angle. In whatever light it may be viewed, however, it points directly to the principle that the rush-hour traffic —whether of strictly urban lines like the Chicago and New York rapid-transit railways, or suburban commuter lines like the main-line railways of these same cities—must be carried without transfer into the heart of the city and must there be discharged not at one point but at numerous stations so distributed as to serve the convenience of the passengers and at the same time avoid local congestion.

Applying this principle to the problem of the Chicago elevated railways, it shows that a complete return to the old stub terminals is not to be thought of. Such a disposition of the matter could not permanently meet the needs of the case, and in effect would only replace one set of evils by another. The present plan of distributing the elevated railway traffic by a number of stations in the heart of the central district must be embodied in any scheme of improvement.

But the second requirement: that traffic must be handled promptly and efficiently—which means that maximum capacity of the available trackage must be developed—points no less clearly to the conclusion that the Chicago elevated loop is the first and greatest obstacle to the development of the city's transit system. For a number of years after it was built, the four elevated railways did not have a traffic heavy enough to approach their capacity, and in that period the loop was able to carry all the trains which these lines supplied. But in the past decade the supply of passengers has been enough to tax the individual capacity of all four lines, could they have developed full capacity. In this period the loop has been congested every morning and evening, in the vain endeavor to force over two tracks the full number of trains which four tracks could supply.

The loop must be abandoned as a piece of union traffic, it is clear. Cutting it into two parts and consolidating the operation of the four supply lines to form two systems is one way of accomplishing this. Building two more loop tracks, so that each line will have its own loop, is another feasible plan. Removing the present loop altogether and building four independent non-intersecting loop terminals, one for each line, is a third method. Any one of these, properly adapted to the case, can accomplish the essential objects of securing full capacity and giving proper terminal distribution. The choice of method may be determined by local considerations, relative costs, etc. But no questions of local preference, mutual antagonism of railway companies, or cheaper construction, can weigh against the necessity for fully meeting the two requirements above discussed: maximum capacity, and terminal distribution.

LETTERS TO THE EDITOR.

Methods and Costs of Stadia Surveys.

Sir: The account of the stadia survey for the location of the Catskill Aqueduct, given in Engineering News, Sept. 3, 1908, p. 248, is very interesting as an example of extremely careful checking. A short statement of a less elaborate method was given by the writer in the issue for June 21, 1906, p. 699. He has found it very convenient also to make a carbon copy of notes as they are taken. This enables the field party to keep in the field as many of the previously taken notes as is desired and at the same time constantly to furnish the office with a complete set of up-to-date notes.

In the case of a loose-leaf book the copy would be made by placing a carbon sheet between two pages and fastening the outside edges with one or two paper clips. With a bound note book a loose leaf and carbon sheet would be fastened by one or two paper clips to the back of each page being recorded upon. The insertion of the carbon sheets requires extremely little time with the resulting advantage of duplicate notes. Also if a check is desired on the reduction of the side shots, the notes and the carbon copies may be worked out independently by different computers and the results compared.

For long distances and when it is necessary to run a stadia line through woods it is desirable to have each foot on the rod marked by a number which cannot be mistaken for another on that rod (as IX. and XI.) especially if an inverting instrument is used. It is also advisable to have the half and quarter foot points marked differently. Such rods, used at the Thayer School of Civil Engineering, have large divisions, each 1 ft. long so that if occasion requires the rod may be used for leveling. The rectangular spaces can be estimated readily to hundredths, and as the distance away to the rod increases the ease of reading becomes very apparent. At long distances the foot divisions are of material aid in reading the number of whole divisions.

Yours truly,
Charles A. Holden.
Thayer School of Civil Engineering, Dartmouth College,
Hanover, N. H., Sept. 15 1908.

Sir: Referring to the article in your issue of Sept. 3, p. 248, "Stadia Surveys for the Catskill Aqueduct," by Mr. Boris Levitt, it occurs to me that some further particulars in regard to this work would be of considerable interest, so that some idea of the cost of these surveys might be obtained.

It would be of interest to know the total area covered, approximate percentage open and wooded, time during which surveys were carried on, number of parties in the field, number of men in each party, salaries, any other expenses affecting the cost of the work in the field, cost of supervision, cost of producing the maps, etc. These latter costs might possibly be given in some convenient unit of area and perhaps if possible might be divided roughly into the different kinds of country surveyed, as, Very Hilly, Rolling, Cultivated, Uncultivated, Wooded, Open, etc.; even the lump sum cost per acre surveyed would be a guide if no other details are available.

From what the writer knows of the conditions affecting these particular surveys, he would judge the methods described to have been well adapted to the circumstances, the required accuracy (within the limits of the scale of the maps) being easily attainable by it. There is, however, a wide difference of opinion as to methods of taking topography, the strenuous advocates of particular methods generally losing sight of the fact that the means should always be adapted and proportioned to the ends and no expense be incurred for unnecessary accuracy.

The fact that the conditions in two different sections of the country can never be the same, of course prevents any absolute comparison between the costs of different methods, but it is believed that the lack of accurate data of the cost of getting topography, together with full notes as to the conditions, degree of accuracy, etc., is the principal cause of the considerable divergence of opinion as to proper methods. Any information, therefore, as to costs of this class of work, it is believed, will be of value and especially so in this case in conjunction with the information already published.

Yours very truly,
F. Lavis, M. Am. Soc. C. E.
134 Elm Ave., Mt. Vernon, N. Y., Sept. 5, 1908.

[Proof of the latter of the above letters was submitted to Mr. Levitt, and he informs us that in the near future he will prepare for publication a statement of costs such as Mr. Lavis suggests.—Ed.]

◆

Novel Manholes for Duct Lines.

Sir: I am sending you under separate cover a photograph and drawings of a duct-line manhole I have recently built in this city. The ducts are for electric wires, both power and telephone circuits, and the main ducts are laid in one trench. Formerly the manholes were built round or barrel-shape and when wires from one side or the other were required to be carried to the opposite side of the street it was necessary to draw them through the other side of the manhole, therefore having high and low-tension wires in the same compartment. As far as I can learn the idea is unique, and I have felt that it might be used to advantage by others interested in duct-line construction. The expense of building each manhole including about 80 ft. of 5-in. drain was $200 complete.

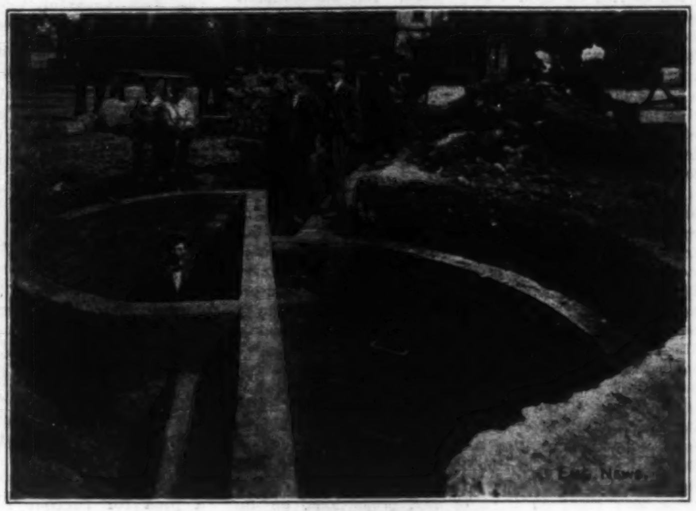

FIG. 1. A NOVEL CONDUIT MANHOLE.
Designed by W. Thomas Wooley, City Engineer, Auburn, N. Y.

Very truly yours,
W. Thomas Wooley.
City Engineer, Auburn, N. Y., Sept. 1, 1908.

◆

"Compressed Air Magazine" a Technical Journal, Not a House-Organ.

Sir: We regret to note, in your issue of Sept. 17, a reference to "Compressed Air Magazine" as the "house organ" of the Ingersoll-Sergeant Drill Co.—more correctly the Ingersoll-Rand Co. This is an error which we believe you will be glad to correct.

"Compressed Air Magazine" is not, and has never been, the "house organ" of any manufacturing concern. Established in 1896, it has since that time been published as an independent trade journal, owned and edited by the President of the Ingersoll-Rand Co.

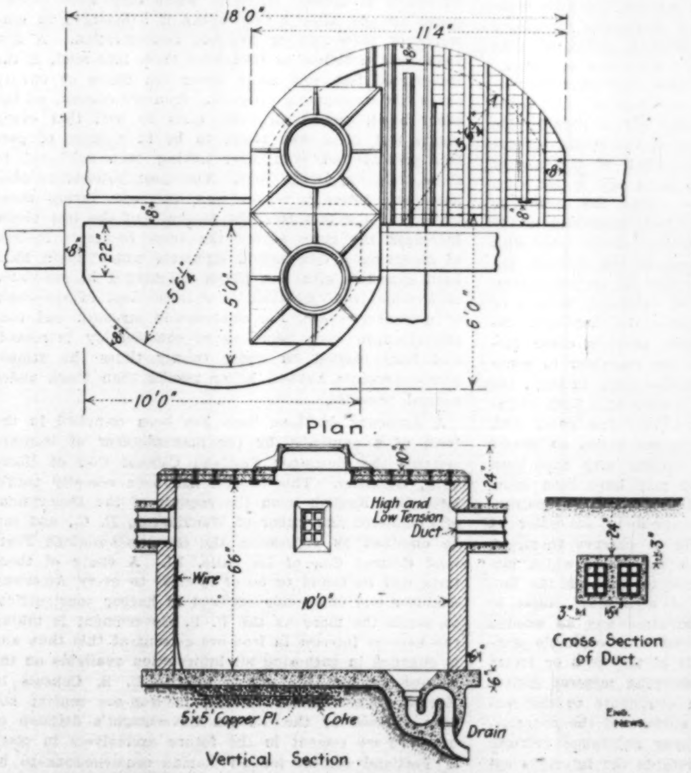

FIG. 2. PLAN AND ELEVATION OF DIVIDED MANHOLE FOR HIGH AND LOW-TENSION CONDUIT LINES.

It is not issued to exploit any machine of any manufacturer. Its aim is the development of a vast field of engineering industry. It is the exponent of a distinct branch of engineering science and is the only publication in the world exclusively devoted to the subject of compressed air in all its applications. Its list of paid subscribers covers every state and territory in the Union and more than thirty foreign countries. Its policy is that of the broad-gage technical journal, not for a moment that of the subsidized "house organ."

Trusting that you will set this matter right before your readers, we are,

Very truly yours,
"Compressed Air Magazine,"
Lucius I. Wightman,
Treasurer and Business Manager.
11 Broadway, New York City, Sept. 18, 1908.

◆

The Decomposition of Concrete in Sea Water.

Sir: The article headed "An Example of the Decomposition of Concrete in Sea-Water" appearing in your issue of Aug. 27, 1908, p. 238, has created considerable inquiry regarding the subject of the action of sea-water upon concrete. The writer has discussed this matter with a number of engineers in the course of the last few years and has for the past three years kept a close watch upon the sea wall at Charlestown Navy Yard, discussed in your article, visiting it frequently by boat and examining it carefully.

In the course of ten years work as representative of a contracting-engineering concern specializing in concrete he has heard a very great deal of discussion regarding the action of sea-water on concrete and as far as possible has examined every example of such action that has come to his notice. In all the cases that he has examined the disintegration of the concrete can as readily be explained by frost action as by decomposition of the cement, and without asserting that every case can be explained either by frost action or by bad concrete he would like to call attention to the conditions actually existing in all tidewater concrete work.

On any work located in tidewater the surfaces between high and low tide are alternately wet and exposed to the air once every twelve hours. In cold climates for many weeks of each year an exposure of an hour or two will freeze several inches into the surface of any masonry. The action of the tide necessarily occurs only in salt water and accordingly such alternate freezing and thawing as often as once in twelve hours seldom occurs in any location where the water is fresh. If water could get into a crack in the hardest of rocks and alternate freezing and thawing should occur once in twelve hours for a long period it is difficult to imagine anything but splitting or spawling occurring at this point. It is common enough to see the surface of sandstone peeling off in layers under this action. In concrete there is no grain as there is in rock and accordingly the splitting action would follow irregular lines and would amount to a general surface disintegration wherever the frost could act.

The work which the writer's company has done in the past fourteen years has taught us the difficulty of getting an impervious concrete. The nearest approach which we have ever got has needed surface treatment to insure its being entirely water tight in all spots. Many places in good concrete are tight, but almost never is the entire structure entirely waterproof on the first tests. A close examination of the sea wall at the Charlestown Navy Yard will show that many spots of the original surface will ring under the blow of a hammer and are as hard as any concrete that you will find, and these spots are almost entirely composed of concrete made of small pebbles of graded sizes which make a dense impervious masonry. A close examination of the work will satisfy one that the denser spots of the concrete have disintegrated but little if at all, whereas the parts of the concrete made of badly graded and in some cases parts containing little stone, have disintegrated badly.

Regarding the necessity of the selection of cement to be used in sea water, there are many more competent to speak than the writer, but it is a matter of mere common sense that any masonry which is to be subject to frequent wettings, freezings and thawings, these occuring sometimes as many as sixty times in succession and at twelve-hour intervals, it is necessary to use a masonry, whether of concrete or stone, that is not in any way porous. The most powerful geological agent in the disintegration of rock is the action of frost, and if we hope to build masonry which will be enduring for all time we must take a tremendous care of the subject of porosity. The writer does not know that still sea-water will disintegrate concrete but he does know that any water assisted by frost will disintegrate any porous concrete or any other porous masonry and that it will follow the crevices between the best block masonry and will throw out not only the pointing but much of the mortar. An examination of the concrete breakwater along the water front at Buffalo, N. Y., made a few days ago, convinced the writer that the surface, at least, of this masonry showed some wear. This was in fresh water; it could only be wet by the rain and by the waves of the lake. The conditions were not a fraction as bad as that of the arches at Charlestown.

The average engineer and contractor does not keep track of old work. His attention is largely taken up by the new work under his charge and when this is completed it is often the last that he sees of it. Many conditions which exist in almost any structure are specially called to his attention and some cause named which is plausible, and this may be accepted without careful examination. In the present instance, the article itself emphasizes enough the possibility of the action of frost. The title from careless reading would indicate a belief in the chemical action of the sea-water being an explanation for the entire difficulty.

Yours very truly,
Aberthaw Construction Co.,
M. C. Tuttle, Sec.
Boston, Mass., Sept. 3, 1908.

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Sir: In your issue of Aug. 27, 1908, p. 238, you give an excellent illustration of the decomposition of concrete in sea-water. Similar cases of disintegrated Portland cement concrete will be witnessed in this country very frequently during the next decade, as the destruction of Portland cement through the injurious action of sea-water is merely a question of time. In the United States, Portland cement has been used to some extent only for the last ten years, namely since the introduction of the rotary kiln, which corresponds with the beginning of the American cement industry. The American engineer's experience with Portland cement, therefore, is of comparatively recent date. If we assume only the last 40 years to comprise that period of the European cement industry during which cement has been manufactured and used on strictly scientific principles, we may safely say that European experience with Portland cement extends over a range of time four times as long as that of the American engineer.

Now, European experience shows that Portland cement concrete used in harbor construction may resist the action of sea-water sometimes for a considerable length of time, but that softening of the surface of the concrete and subsequent disintegration of the mortar are bound to come in time, that is to say, if not after a period of ten years, certainly within the second or third decade. The sulphuric acid salts contained in the sea-water combine with the calcium oxide and with the alumina of the Portland cement and destroy the cohesion of the mortar by a process of crystallization. Within the dense conglomerate of dried-out colloids or "mineral glues," which constitutes the hardened cement, crystals are formed. These crystals cause distention of the mortar and allow the sea-water to penetrate into the interior of the concrete until, in time, the whole block or wall or pier is destroyed. Such disintegration can be observed after a very few years with every concrete block submerged in sea-water, no matter how good a brand of Portland cement may have been used or how well the concreting may have been done. The reason why all harbor work does not go to destruction as rapidly as blocks submerged in sea-water at quiet places where we are able to observe them, or placed into reservoirs filled with sea-water, which latter has to be renewed from time to time, is the fact that the concrete is soon covered with moss, algae or other forms of vegetation in the same way as wooden piles kept under water are covered with vegetable matter. Moreover, the rise and fall of the tides or rivers feeding into the harbors and carrying mineral matter of various origin in suspension contribute to the formation of a slimy film on the surface of the concrete. This film of vegetable and clayey substance protects the concrete for some time; it retards the injurious action of the sea-water, but does not prevent it. Ultimate destruction is merely delayed. The advocates of Portland cement for marine construction frequently point out that blocks submerged in sea-water are not fair test pieces for the determination of the behavior of concrete towards sea-water. They must, of course, admit that concrete blocks kept in sea-water disintegrate after a number of years, but nevertheless do not consider this a sign of warning, as long as a pier built of the same concrete is not seriously damaged after the same length of time. The experiment with the concrete block is an accelerated test. The concrete block kept in a reservoir or in quiet water can not be covered with vegetable and mineral matter. Consequently it disintegrates after a short time and thus gives warning of what is going to become in time of the concrete work carried on upon a large scale. But unfortunately many engineers will not take heed and insist upon Portland cement being a sea-waterproof cement, solely for the reason that we have made use of it for marine construction so far. That Portland cement has been used so long for harbor construction is due to the fact that men of science had to determine at first the cause of the destruction of Portland cement in sea-water. Only after this was accomplished a remedy could be found.

During the last ten years iron-ore cement has gradually taken the place of Portland cement in marine construction. This cement, made under patents controlled by the Krupp Steel Co., of Magdeburg, Germany, is manufactured in the same manner as ordinary Portland cement, with the only exception that iron-ore instead of clay is used in its manufacture. Hereby a cement is obtained which contains next to no alumina. The elimination of the alumina renders the cement proof against sea-water, as in this case no compounds can be formed which may crystallize and thereby destroy the cohesion of the mortar. This theory, upon which the manufacture of iron-ore cement is based, has been fully supported by the severest tests carried on for the last ten years by the foremost testing institutions in Europe. Such experiments with iron-ore cement have been made on work of vast proportions, for instance extensive harbor constructions and fortifications, as well as on a small scale, that is to say, on blocks, briquettes and pats submerged in sea-water. In order to make these tests unusually severe and to reveal any detrimental effects of the sea-water which possibly may become noticeable in time, iron-ore cement has been subjected not only to sea-water of normal strength, but also to concentrated sea-water, that is to say to solutions which contained three times and five times as much salt as sea-water does. Moreover, as severe as these tests were, they were made even more rigorous. To tests made under atmospheric pressure a long series of tests was added which were subjected to ten times and twenty times this pressure. These were accelerated tests which served to show within a few weeks what would become of a cement after as many years under atmospheric conditions. The results obtained from these tests invariably showed that the best brands of Portland cement disintegrated after a few years in sea-water of normal strength, while they were decomposed already after a few weeks if submerged in sea-water of three-fold or five-fold concentration. A few days were sufficient to transform them into mud, if the last-named test was made under ten times or twenty times the atmospheric pressure. Iron-ore cement, on the other hand, passed all these tests so well that every single test piece was found to be in a state of perfect preservation even after having been subjected to these tests for many years. The most noteworthy phenomenon, however, which was observed during these tests, was the fact that the strength of the test pieces increased the more severe the tests became. Instead of observing a decrease in strength, which might have been expected with test pieces submerged in sea-water of five-fold concentration, over those kept in sea-water of normal strength, the compression strength and tensile strength were found to be considerably increased, and tests carried on under twenty times the atmospheric pressure showed better results than those under normal pressure.

A summary of these tests has been compiled in the form of a pamphlet by the manufacturer of iron-ore cement, the Hemmoor Portland Cement Co., of Hamburg, Germany. This booklet has been recently translated into English upon the request of the Department of Commerce and Labor of Washington, D. C., and can be obtained by addressing the German-American Portland Cement Co., of La Salle, Ill. A study of these tests will be found to be of interest to every American engineer and contractor engaged in harbor construction, so much the more as the U. S. Government is taking the keenest interest in iron-ore cement at this time and is engaged in gathering all information available on the subject through the offices of the U. S. Consuls in Europe. This sudden interest in iron-ore cement has been aroused by the German Government's decision to use iron-ore cement in the future exclusively in place of Portland cement for all marine constructions to be carried on. The German Government has given iron-ore cement a thorough trial for the last ten years and now takes the standpoint that iron-ore cement, although slightly more expensive than Portland cement, considerably reduces the cost of harbor works in the long run, as it does away with the constant costly repairing so far required.

The German-American Portland Cement Co. has frequently supplied small lots of iron-ore cement for experimental purposes to engineers on the Atlantic Coast and will do so in the future upon request.

Yours truly,
Dr. W. Michaelis, Jr.,
Cement Expert.
Schiller Bldg., Chicago, Sept. 5, 1908.

[The various conditions which together aid the disintegration of concrete marine structures were quite fully discussed in an editorial we published in our issue of July 18, 1908, p. 65. We then said that this deterioration would seem to be partly chemical, a result of the action of the salts in the seawater, and partly physical, a combination of the alternate freezing and thawing and the material battering of flotsam. The deterioration is further aided by the rise and fall of the tide, which exposes a small portion of the surface to concentrated action, and by porous concrete, which permits both chemical and physical action in the interior of the mass. From available testimony it is probable that the chemical action is not so certain as the second of the above letters infers, for there are many instances where a good concrete wall has stood for many years in sea-water with no more pronounced wear than would have occurred in any other masonry wall. On the other hand, the action is not as entirely physical as the first letter implies.

At the time of the previous editorial we made a plea for further information on actual cases of marine concrete behavior from engineers who are in a position to give it, but received few replies. In view of the interest shown in the above two letters, we now renew this plea.—Ed.]

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A Civil Service Examination for Highway Commissioner That Has Made a Political Row at Philadelphia.

Sir: Some of your readers may be interested to know the character of examination which the Philadelphia Civil Service Commission require of applicants to fill $2,400 jobs as Highway Commissioners, the character of the work and the pay being such that the positions should be readily filled with competent engineers.

You will note that outside of a little childlike arithmetic, the applicant had to answer one question involving a little knowledge of concrete while the balance of the questions referred not to engineering knowledge of the subjects concerned but to the existing department specifications.

The methods of Civil Service reform as it is managed by the present city administration in this connection, is interesting. The positions of Highway Commissioners were first filled by provisional appointments of some political friends of the contractor-bosses who run the city. These appointees had held those positions previously for years, yet the simple little examination, mostly on the specifications they are supposed to have been enforcing all this time, was too much for them, and they "flunked" because they could not pass a 70% examination on such questions. As a result, the Mayor is wrathy. He has demanded the heads of the Commission because the questions were too hard, and they, in turn, have concluded to try and save themselves by decapitating the Chief Examiner, who won his place by a competitive Civil Service examination under the previous commission, and who seems to be the only one in the outfit with the courage to stand up against the contractor-bosses.

It should be noted that no hint was given to "outsiders" that this "open and free" competitive examination would be mainly made up of questions which an incompetent insider should be expected to know more completely than a well trained engineer from the outside.

Isn't Philadelphia's government a bright star in the galaxy of free American municipalities?

Very truly yours,
Cassius E. Gillette.
1031 Land Title Bldg., Philadelphia, Pa., Sept. 10, 1908.

[The examination questions that have created such a fuss at Philadelphia are as follows:

ARITHMETIC.

Note—In solving the following problems, show all of the work for each problem on the sheet which you turn in. In this way credit may be had for any correct part of a solution when the entire solution is not correct.

(1) How many square feet are there in a pavement 60 ft. wide and 420 ft. long?

(2) What will be the cost of paving a street with asphalt which is 80 ft. wide for a distance of 650 ft., at $1.52 per sq. yd.?

(3) A certain street is to be graded for the distance of 800 yds., the side slopes being 1 ft. horizontal to 1½ ft. vertical and the average cut to be 6 ft. The street is 60 ft. wide. How many cubic yards of earth will be removed?

(4) How many barrels of cement and how many yards of sand, stone and concrete will be required to lay a

concrete base 6 ins. thick, on the above street, if the concrete is made in the following proportions: 1 part cement, 3 parts sand or gravel and 6 parts broken stone; 1 bag of cement equals 1 cu. ft. and 4 bags cement equals 1 bbl.?

PRACTICAL QUESTIONS, HIGHWAY WORK.

(1) There are at least 14 different kinds of work which come under the direction of the Highway Division of the Bureau of Highways and Street Cleaning. Name ten of them.

(2) What orders would you give an inspector as to the important points to be watched in the following cases—as provided for in the department's specifications and regulations:

(a) When the sub-grade is being prepared for the concrete base of asphalt pavement?

(b) As to what materials should enter into a concrete base, and their proportions?

(c) What when the concrete base is being laid?

(3) How far below the top of the curb must the finished grade of the street be?

(4) What must be the rise per 100 ft. of the crowning of the finished pavement from the gutter toward the center of the street?

(5) Give the largest and smallest sizes of broken stone which may be used in concrete for bases for paving.

(6) Give in detail the method to be observed in laying granite blocks, after the base has been laid.

(7) The specifications mention certain conditions of the surface of the concrete base which would render it unfit for the laying of the binder course; what are they?

(8) What protection must a contractor give cement which is to be used in making concrete?

(9) How soon after the surface of an asphalt street has been finished may it be opened for traffic?

(10) Give a summary of the paragraph in the street paving specifications which specifies the kind of sand or gravel to be used in making concrete.

TEN PRACTICAL QUESTIONS ON STREET CLEANING.

(1) Give in detail the proper method of cleaning asphalt streets.

(2) With what implements are block men supplied for doing their work?

(3) Are decayed vegetables or fruit from dealers considered garbage, and what has the contractor to do with such refuse?

(4) Specifications mention nine classes of work which are under the direction of the Street Cleaning Division of the Bureau of Highways and Street Cleaning. What are they?

(5) Give a summary of the specifications with reference to the kind of wagons contractors must use for the collection of garbage.

(6) Between what hours of the day must garbage be removed from buildings and how often must it be removed each week?

(7) How often each week must private alleys be cleaned?

(8) Specifications state that streets must not be sprinkled so as to turn the dirt into mud, when preparing to sweep. Why is this restriction made?

(9) If a garbage collector found paper mixed with the garbage from a certain house, would it be his privilege to refuse to take the garbage, or would he be obliged to take garbage and paper?

(10) In the event of a person being sent to clean out an inlet and he found it dry, what would be his duty in the matter before attempting to remove all the dirt?

Major Gillette has kindly forwarded a bunch of clippings from Philadelphia newspapers which give further details of this shameful prostitution of Civil Service examinations. It is needless to summarize the newspaper story further than Major Gillette has done it, but we will give space to a letter which the Chief Examiner recently addressed to a member of the Philadelphia Civil Service Commission:

> Dear Sir: Referring to your instructions of Aug. 20, directing me to review, with the object of giving more liberal marks, the papers of the applicants for the position of Inspector of Highways, examination for which was held May 29, last, I beg to report that I have carefully gone over the papers again. I have given special attention to the notations made by you after the "Practical Questions," and, with all deference to your opinion, I cannot of my own initiative, give any other marks than those on the papers, believing them to be sufficiently liberal as they stand.
>
> With reference to the notations made on the various reports by you I am obliged to assume the same attitude. The report is intended, in a limited way, to bring out the candidate's educational qualifications. It is the only attempt along these lines in the examination. and if punctuation and capitalization are less rigidly marked this object would, in a great measure, be defeated, and the grade given would not so nearly represent the mental caliber of the candidates. The elimination of a number of these deductions would, of course, result in better ratings for the applicants in this subject, and a consequently better average. I should, however, advise against this procedure.
>
> If it is your desire that I make the changes as suggested by the marks you have placed after the questions, and also eliminate the larger number of the punctuation and capitalization deductions in the reports, I shall, of course, do so. Respectfully submitted,
>
> Wm. D. Earnest,
> Chief Examiner.

Instead of receiving specific directions to alter his marking of the papers Mr. Earnest's "head was chopped off," as the political phrase is.

This whole incident, unfortunately, is only one out of many possible illustrations of the muddy depths into which the municipal government of Philadelphia has sunk—or perhaps we should say, in which its political bosses and their henchmen have wallowed for years past. The friends of good government are always at work there, but the mass of the voters are either so in sympathy with the forces of evil or so apathetic that it is only when the gangsters go to some extraordinary extreme that public opinion rallies to the support of the comparatively few workers for good government. Such rallies are spasmodic. If perchance one devil be cast out and the municipal house be swept and cleaned somewhat it only makes easy the way for seven other devils to enter and take possession.

We seize this occasion to apologize to our readers for the large amount of space devoted to Philadelphia matters in the past, in view of the apparent hopelessness of reform there. And yet we give further space to the subject out of consideration to those who, in the face of so many successive disappointments, still keep up the fight. It is worth while to encourage even one good man, for was there not promise to Sodom and Gomorrah if peradventure one good man could be found in their midst? Now, there is not only one good man but many thousand good men and true in Philadelphia. Their hands must be held up for their own sakes, and in the hope that some day, not too far in the future, they or their successors will achieve at least some measure of permanent municipal reform in Philadelphia.—Ed.]

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Notes and Queries.

A correspondent who is designing an overfall dam 170 ft. in height, with overfall length of 320 ft., "would like very much to know how other engineers have taken care of the possibility of erosion at the toe of the dam." We think other engineers would be interested in knowing how this has been done, in case any one has been bold enough to attempt it heretofore.

Information is requested by a reader as to the existence of large rock cuts on railways, particularly cuts reaching several hundred thousand cubic yards. Brief descriptions of such pieces of excavation work, with a statement of methods, speed, etc., will be of interest, and we shall take pleasure in printing them. The Pennsylvania freight line work described in our issue of Dec. 28, 1905, contained several very large side-hill rock cuts.

◆

ANOTHER DIAGRAM FOR SPACING BANDS ON WOOD-STAVE PIPE.

In our issue of Sept. 3, 1908, p. 255, we gave space to a diagram for the spacing of the bands on wood-stave pipe,* which had been devised by Mr. Bertram D. Dean. In Mr. Dean's scheme a separate diagram had to be made for each size of band used. We present here a diagram by Mr. E. A. Moritz† which, by the aid of a simple slide-rule calculation, can be utilized for all heads, size pipes and bands.

Using the same nomenclature as in the previous article, that is

S = spacing c. to c. of the bands in inches.
A = sectional area of band in sq. ins.
L = safe tensile stress in the steel lbs. per sq. in.
H = head of water in feet.
R = inside radius of pipe.
F = number of bands per 100 ft.

the following equations result:

$$S = \frac{A\ L}{0.434\ R\ H} = \frac{2.307\ A\ L}{R\ H}$$

and $F = \dfrac{520\ H\ R}{A\ L}$

For any given case the quantity $\dfrac{2.307\ A\ L}{R}$ = constant = C, and the quantity $\dfrac{520\ R}{A\ L}$ = constant K, then $S = \dfrac{C}{H}$ and $F = K\ H$, two equations easily solved on the slide rule, once C and K are known.

It is to find these two coefficients that the diagram is devised. For either coefficient, with L and A constant, the curve is a straight line. The diagram herewith gives values for C and K, for the four unit stresses, 15,000, 14,000, 12,000, and 10,000 which are most likely to be used and the four sizes of rods, ¾, ⅝, ½ and ⅜-in. diameter, and for a large variety of pipe diameters.

The method of using the diagram is described by Mr. Moritz, as follows:

Assume the following problem:
Diameter of pipe, 48 ins.
Size of band to be used, ⅝-in.
Unit stress selected, 12,000 lbs. per sq. in.

To determine the spacing of bands and number of bands per 100 ft. of pipe for any head:

On the left of the diagram find the diameter of the pipe, 48-in. Follow horizontally to the right to the inclined line marked "⅝-in. at 12,000 lbs.;" thence vertically downward to the values of C = 353 and K = 3.40 on the lower horizontal scales. Now set the value of C on the slide rule and di-

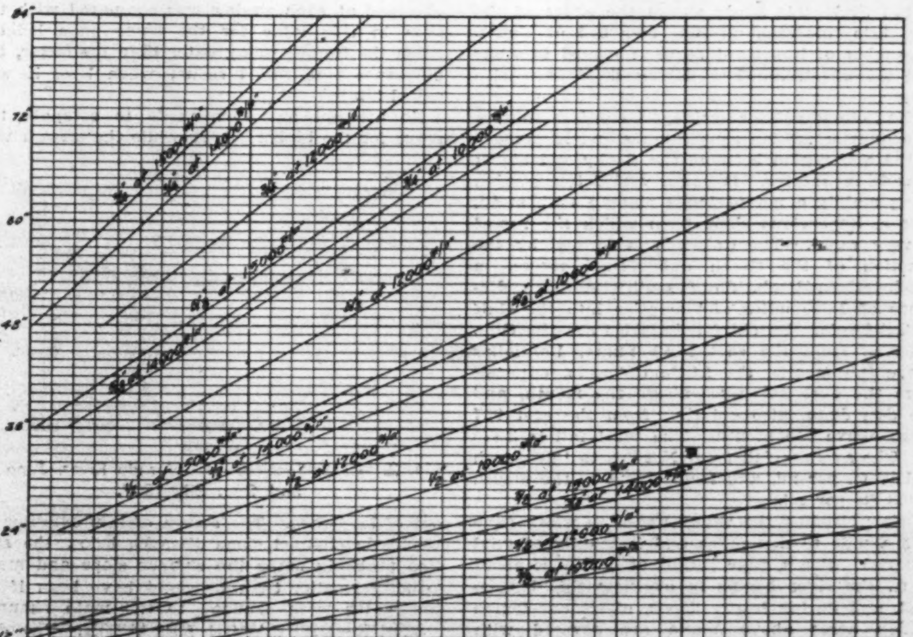

DIAGRAM FOR SPACING BANDS ON WOOD STAVE PIPE.
(Devised by Mr. E. A. Moritz, Assistant Engineer, U. S. Reclamation Service.)

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*Note that in this article the formula at the top of the second column, p. 255, should be $S = 34560 \dfrac{A}{RH}$. This was a misprint; the rest of the equations and the deductions are correct.

†Assistant Engineer, U. S. Reclamation Service, Sunnyside, Washington.

vide successively by the various heads to obtain the spacings, then set the slide rule to the value of *K* and multiply by the various heads to obtain the number of bands per 100 ft. The spacings as thus determined are, of course, given in inches and tenths of an inch, but the tenths are very easily transformed mentally into sixteenths, if desired, or a comparative scale of sixteenths and tenths can be placed alongside the diagram to aid the mind if necessary.

◆

CHANGES IN BED AND DISCHARGE CAPACITY OF THE COLORADO RIVER AT YUMA, ARIZ.

By E. C. MURPHY.[*]

The departure of the Colorado River from its channel during the remarkable floods of 1905 and its flow into Salton Sink instead of into the Gulf of California for many months; the heroic efforts that finally were successful in turning the river back into its channel to the Gulf and the enormous loss that would have resulted if the back cutting of the bed had extended to the Laguna dam have awakened much popular interest in this stream.

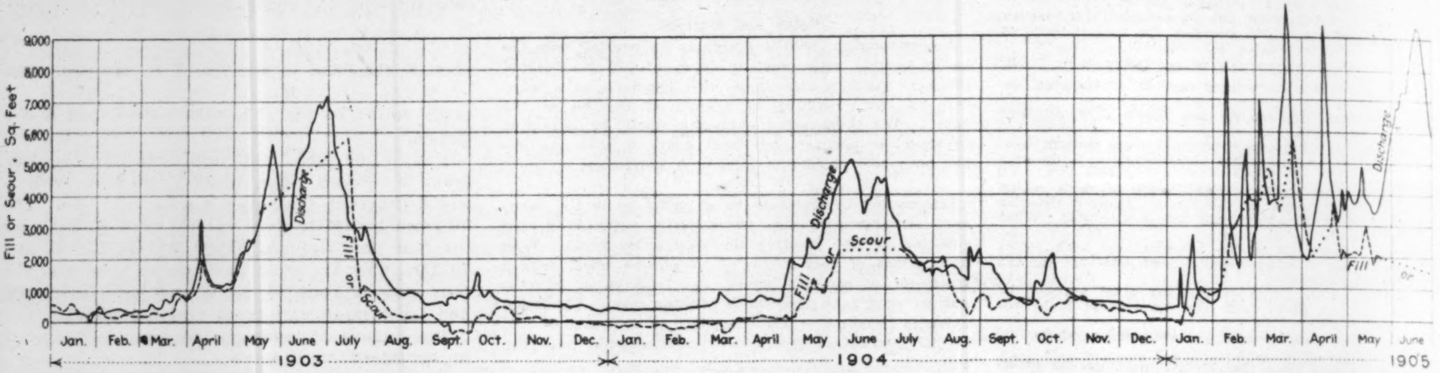

FIG. 1. DISCHARGE AND SCOUR OF THE

Another matter of no small interest is the apparent increase in the flow of this river from 1903 to 1907, as shown by Table I. It has been suggested that this increase is due to decrease in channel carrying capacity, the river bed having gradually raised. The study here reported was undertaken primarily to answer this question as far as may be possible from a five-year's record[†] of the changes taking place at the gaging station at Yuma. As this five-year period includes the time that the river was flowing into Salton Sink, this study shows the effect of the flow into this sink on the river bed at Yuma. A number of important facts in regard to scour and fill of stream bed during floods are also shown.

The Colorado River drainage basin has an area of a quarter million square miles and is situated in the arid region between the Rocky and Sierra Nevada mountains. It has a varied topography, being mainly a mountainous plateau with steep, barren, impervious slope from which the runoff is very rapid. The Colorado is formed by the junction of the Green and Grand rivers, in southwestern Utah, flows southwesterly a distance of 1,080 miles and empties into the Gulf of California. Its chief tributaries are the Gila, entering from the east near Yuma, 150 miles above the mouth; the Little Colorado, entering from the east 815 miles above the mouth, and the San Juan, also entering from the east 957 miles above the mouth. The total fall is 3,775 ft. The average fall from Needles to the mouth is 1.17 ft. per mi. and from Yuma to the mouth is 0.8 ft. per mi.

Below Needles, the valley varies in width from half a mile to five miles and is mainly alluvial material. For a gage height at Yuma of about 26 ft. the river begins to overflow this bottom land, and during heavy floods, about one-fourth million acres above Yuma are covered with water.

This river is subject to two very different kinds of floods: Those from the Gila occur in the winter and spring, are very heavy, but of short duration; those from the upper Colorado occur during June and July, due to the melting of snow in the mountains, and are of several weeks' duration.

The gaging station at which the records used in this study were obtained is located about 600 ft. below the railway bridge at Yuma and about one mile below the mouth of the Gila River.

The right bank is low and for gage heights above 26 ft. a part of the flow passes through side channels and is measured from railway trestles. The main channel is about 600 ft. wide. Measurements of depth and velocity in it are made from a car on a cable. The bed is very fine material which is very sensitive to changes of discharge. Surface fluctuations are read on a gage, one part of which is fastened to a pile a short distance above the bridge, the other to a pile a short distance below it. The first gagings were made in 1902, and since that time three gagings per week have been made. The estimates of discharge for the period 1887 to 1902, given in Table I., are made from a mean discharge curve and are subject to large errors due to changing bed. The discharge estimates since 1903 are computed from the gagings and the change of bed.

In order to show the changes of bed at this station, I have compared the cross sectional area obtained from each gaging with a standard cross-section prepared from the gaging of Jan. 4, 1905. A table of areas was prepared giving the cross sectional area for each tenth of a foot of gage height from the lowest gage height to that of overflow in the side channels. The area obtained at each gaging was compared with the area in this table for the same gage height; when the former was greater than the latter, the difference was called scour; when less, it was called fill.

No attempt has been made to compute the scour for the higher stages while the stream was out of its banks. The return of this overflow to the main channel some distance below the station probably made the surface slope and mean velocity smaller than it would have been if all the water were confined to the main channel.

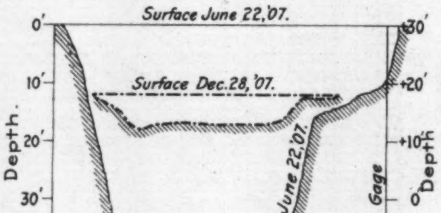

Fig. 2. Cross-Sections of Colorado River, June 22 and Dec. 28, 1907.

TABLE I.—MEAN ANNUAL DISCHARGE IN ACRE-FEET OF THE COLORADO RIVER AT YUMA, ARIZONA, 1878 TO 1907.

Year.	Discharge.	Year.	Discharge.	Year.	Discharge.
1878...	3,133,000	1891...	7,200,000	1903...	[illegible]29,000
1879...	1,976,000	1892...	7,427,000	1904...	[illegible]19,000
1880...	4,079,000	1893...	5,689,000	1905...	[illegible]37,000
1881...	4,340,000	1894...	5,390,000	1906...	[illegible]90,000
1882...	3,420,000	1895...	7,062,000	1907...	[illegible]9,000
1883...	4,965,000	1896...	6,515,000		......
1884...	10,504,000	1897...	9,039,000		......
1885...	4,608,000	1898...	6,181,000		......
1886...	4,960,000	1899...	8,870,000		......
1887...	3,527,000	1900...	6,798,000		......
1888...	3,367,000	1901...	8,495,000		......
1889...	3,390,000	1902...	7,960,000		......
1890...	7,569,000		....		......
Mean..	4,603,000	Mean..	7,219,000	Mean..	[illegible]63,000

NOTE:—The discharge for the period 1878 to 1902 was computed from daily gage readings during this period and from a discharge curve prepared from gagings made in 1902 and 1903. As the bed changes rapidly with discharge, the computed discharge during this period is subject to large errors.

SCOUR—DISCHARGE RELATION.—The discharge for the period 1903-7 and the corresponding scour or fill of bed for the same time, except on the days when a part of the flow passed through side channels, are shown in Fig. 1. It is seen that the bed at this place is generally quite sensitive to changes in discharge, rising as the discharge decreases, falling as the discharge increases. It is generally more sensitive to a decrease in discharge than an increase. In some cases one or more days elapse after a rise begins before the scour is noticeable. This fact is probably due to the water being very heavily loaded with silt during the higher stages. The filling often continues for several days after the discharge has stopped decreasing. The change in bed is seen to be large and rapid during floods. For example, during the 4-day period March 5 to 9, 1907, there was a scour of 2,125 sq. ft. or about 1 ft. depth per day. Again, in the 9-day period July 13 to 22, 1907, there is a fill of 4,900 sq. ft., or nearly 1 ft. depth per day. The magnitude of the fill from June 22 to Dec. 28, 1907, between high and low water, is shown in Fig. 2, and the variation in the ratio of the scour area to the water area for the year 1907 is shown in Fig. 1.

SCOUR — MEAN-VELOCITY RELATION.—The variation in mean velocity for the year 1907 is shown in Fig. 1. For a sudden rise the velocity increases rapidly until the bed has had time to scour sufficiently to restore equilibrium, after which it decreases for a time. Once during 1907 (Feb. 2) at the beginning of a sharp rise the mean velocity rose to 8.15 ft. per sec., but two days later it had fallen to 5.8 ft. per sec., and during the summer flood, when the discharge was more than three times greater than on Feb. 2, the mean velocity was only 6.5 ft. per sec. The scour and mean velocity curves frequently cross each other during the higher stages. During the three months of low water, from December, 1903, to February, 1904, while the bed was in a state of equilibrium, the mean velocity varied from 2.3 ft. to 2.6 ft. per sec.

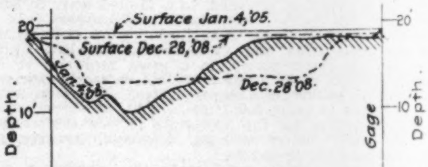

Fig. 3. Cross-Sections of Colorado River, Jan. 4, 1905 and Dec. 28 1907.

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[*] M. Am. Soc. C. E., U. S. Geological Survey, Berkeley, Cal.

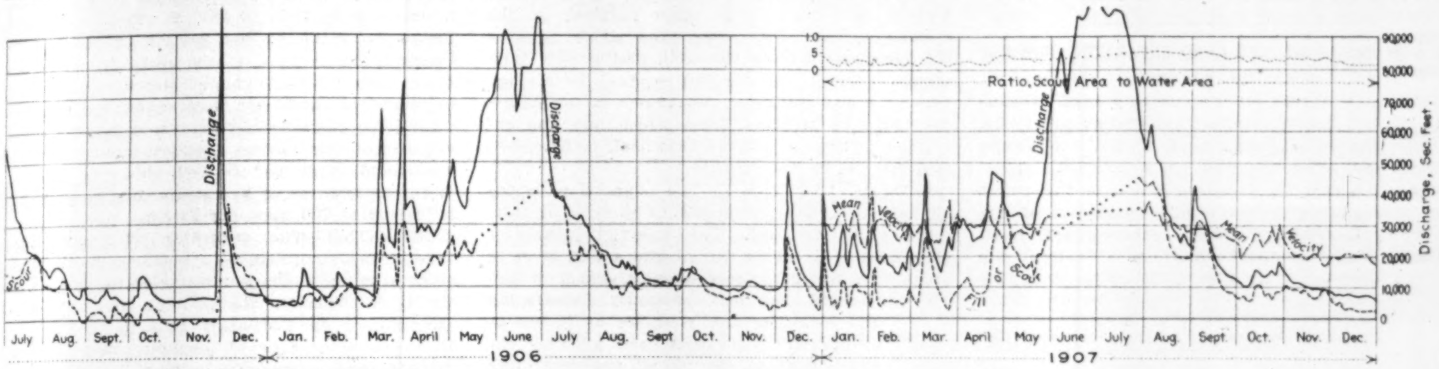
[†] Used with permission of the Director and Chief Hydrographer of the U. S. Geological Survey.

TABLE II.—BEHAVIOR OF COLORADO RIVER IN 1903, 1904 AND 1907.

Date.	Gage height, ft.	Area, sq. ft.	Discharge, sec. ft.	Mean velocity, ft.	Scour, sq. ft.
Feb. 16, '03...	18.0	1,549	3,973	2.56	183
Jan. 4, '05...	18.60	1,595	3,985	2.50	0
Dec. 28, '07..	18.15	1,700	6,300	3.72	295

EFFECT OF SCOUR ON STAGE.—The effect of scour of bed is to reduce the elevation of the water surface. During flood stages this effect is very marked, the depth of scour being greater than the rise of the surface. For the case shown in Fig. 2 there is a difference in elevation of water surface between flood and low-water stage of 11 ft., whereas the mean elevation of the bed during flood is 13 ft. less than at low water. That is, the bed lowered 1.2 times more than the surface rose.

EFFECT ON BED OF STREAM OF FLOW INTO SALTON SINK.—The Colorado River cut its way through the low ridge separating it from Salton basin during the spring and summer floods of 1905, and was permanently turned back into its channel to the Gulf on Feb. 11, 1907. Fig. 3 shows the cross-section of the river on Jan. 4, 1905, and also one on Dec. 28, 1907. Table II. gives additional data bearing on this question.



COLORADO RIVER AT YUMA, ARIZ., 1903 TO 1907.

These cross-sections are quite different in shape, the maximum depth of the former being 9 ft. and the latter 5.5 ft., but when the difference in stage and discharge are properly accounted for, there is little change in channel discharge capacity at the latter date as compared with that at the former.

There is some evidence of an increase in channel capacity in the fall of 1905 while the river was discharging into Salton Sink. From Oct. 20 to Nov. 27, 1907, the discharge varied from 5,500 sec. ft. to 6,800 sec. ft.; the stage from 18.35 ft. to 18.85 ft., and the mean velocity from 3.5 to 4.1 ft., while there was a fill, as compared with the standard section, of from 0 to 200 sq. ft. There is an increase in mean velocity at a low stage without a corresponding lowering of the bed.

CHANGE IN CHANNEL DISCHARGE CAPACITY.—The answer to the question which gave rise to this study can now be given. Although the discharge capacity of this channel is constantly changing, increasing as the discharge increases and vice versa, the change, coming partly from change in velocity, but mainly from changes in cross sectional area, yet when we compare data at low water at times when the discharge is approximately the same and the cross sectional area has had time to fully adjust itself to the discharge, we find very little change in the carrying capacity of the channel. The larger increase in discharge shown by Table I. is not due to change in channel carrying capacity.

OVERSPEEDING AUTOMOBILES at crossings is to be stopped on certain Long Island macadam roads, according to reports which we have not verified, by building across the road, on either side of the crossing, transverse hummocks, which can be seen by the driver some distance away. A similar scheme has been adopted with considerable success in a suburb of Chicago, where the hummock was made by raising the sidewalk crossing some distance above the road level.

THE RELATION OF THE ENGINEER TO MECHANICAL FILTER MANUFACTURING COMPANIES.[*]

By F. B. LEOPOLD.[†]

Years ago the installations of filter plants were practically in the hands of the manufacturers, and consisted either of steel pressure filters or wood tank gravity filters. They were seldom installed in the construction of a water plant unless by reason of personal solicitation of the builders. The filters were built on empirical lines and to meet ruinous competition, and installed after a long campaign of missionary work, costing often a large proportion of the amount received; and the results were not always all that could be desired. Engineers at that time would simply ask for bids on a filter of certain required capacity.

The experiments conducted at Louisville, Ky., marked an epoch in mechanical filtration in many ways. These experiments were conducted by the Louisville Water Co. at an expense of many thousand dollars of the filter companies' money. Those who entered the experiment did so with the expectation that if they could demonstrate their ability to properly purify the water a contract would result therefrom. The demonstration was successful, but instead of a contract, it was the turning point in the attitude of engineers toward mechanical filtration. Its efficiency was recognized, but the engineers used the information gathered at the expense of the filter companies and applied it in the construction of a plant in which the manufacturers were not given even a shadow of a chance for the return of a dollar of the money expended by them.

Since then the few engineers that have made a sufficient study to have acquired a knowledge of the principles of mechanical filtration, and a great many that have not, have adopted a policy of designing and building filter plants and ignoring the existence of filter companies, or if not ignoring them, eliminating them as much as possible from possible competition in the building of such plants; although it was, undoubtedly, the considerable sums of money spent by these companies in solicitation, education and experimental work which at least hastened to create the demand, demonstrate the efficiency of mechanical filters and, incidentally, open a new field for engineering effort, after which it would seem that they were entitled to some recompense and consideration at the hands of the engineers. The reasons given and apparent seem to be about as follows:

(1) The character of the work has changed and is now a special branch of engineering.

(2) Builders sacrifice quality in competition.

(3) The work should be designed in detail by the men responsible for its success.

(4) By buying materials entering into construction in the wider market it costs the clients less than bought from filter companies who charge large sums for patent right and past missionary work.

(5) Clients run chances of contracting with builders who are either incompetent or dishonest.

(6) The filter companies act as engineers wherever possible, and draw plans and specifications, thereby cutting out the engineers from the field and the fees to which they are properly entitled.

Now, on the part of the builders, their answer and position is as follows:

(1) That the character of the work is changed, as is fully recognized that it is a special branch of engineering, just as building of pumping machinery, engines and other mechanical equipment is. That there are few engineers who have made a special study of this particular branch and are competent to design plants for efficiencies is also contended.

(2) Builders undoubtedly do on occasion sacrifice quality to competition. This is probably due as much to the position taken by the engineers as to the companies themselves, and where propositions are necessarily put as they are by filter companies in many cases to water committees or others who have no engineering knowledge and the price is often the main consideration; in such cases some builders undoubtedly design plants that they would very much rather not build.

(3) That the work should be designed in detail by the party responsible for its success is fully agreed to. When filter companies design plants in detail and assume contracts, they assume absolute responsibility for its success. Engineers very often design plants in detail, then ask builders to assume the responsibility for the successful working of these plans, a position at once inconsistent and unreasonable. If the engineer, on the other hand, does not ask the contractor to assume the responsibility for his plans, then the client does assume such responsibility, but in no case has the writer ever heard of an engineer assuming responsibility financially for the successful working of his plans. Were this the case many of them would not be so ready to eliminate the filter construction companies.

(4) The contention that the purchase of material in the open market costs the client less for construction, the filter companies maintain is only apparent. While it is necessary for them to make a certain charge to cover the money expended in selling, patents, etc., this is a very nominal charge and does not even approximate the amounts that I have heard given by many engineers. That the purchase of cast-iron pipe, valves and other material entering into the construction of a filter can be made direct by a client for approximately the same money that it costs a filter construction company is undoubtedly true.

(5) That clients run chances of contracting with builders either incompetent or dishonest is true. The same reason applies to engineers with greater chances, owing to the larger number of them.

(6) That filter companies act as engineers in the drawings of plans and specifications and to a certain extent eliminate engineers is true. This condition, however, they maintain has been taken in self-protection, and by reason of the position taken by engineers and is a position they would prefer I feel satisfied not to occupy, when taken in opposition to those engineers who are recognized as being equipped with the proper knowledge for design and construction of a plant; it is by reason of the fact that these engineers insist in designing in detail all parts of the apparatus entering into the plant, generally each plant constructed requiring an absolutely new set of patterns for all mechanical parts, just enough different from the standard pattern of filter companies to make them unacceptable, and in many cases, not as satisfactory, but adding to the costs more than the profits the filter company would have been satisfied with on their own construction, the client, however, paying the bill.

A harmonious working condition could be brought about as follows:

Were the recognized filter engineers to consider the filter contractors as the best source of supply for their material, and leave open such details of construction as require individual standards and select therefrom the best which were offered by recognized manufacturers, by so doing it would excite the efforts and energy in the production of the best type of material by the builders, each bending their effort to improve and increase the efficiency of his apparatus by the selection of the best offered. The cost of the plants would undoubtedly be less, efficiency continually greater, the actual work of the engineer for his compensation would be less, and the general results to all concerned undoubtedly more satisfactory. To the engineer in general practice, who is not an expert but is fully equipped for passing upon mechanical devices submitted, the general outline designs of construction work carried out on lines that so generally recognized as not to be very far wrong, leaving completely all details of arrangement and construction to the filter companies, as well as responsibility for results, would result in a better class of installation for the smaller plants; the same contention among manufacturers to give better designs knowing that their plans would be passed upon by some one competent to consider the cost of mechanical apparatus, and properly value and weigh explanations, and select the best apparatus for the money offered instead of the lowest money offer, exclusive of worth, would eliminate incompetent and dishonest builders, would result in the ordinary engineer securing a class of installation that would be a credit to him, that would be permanent and economical to his client, uniformly efficient, and considerably less costly.

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[*] Abstract of a paper read before the Central States Water-Works Association, Pittsburg, Pa., September, 1908.

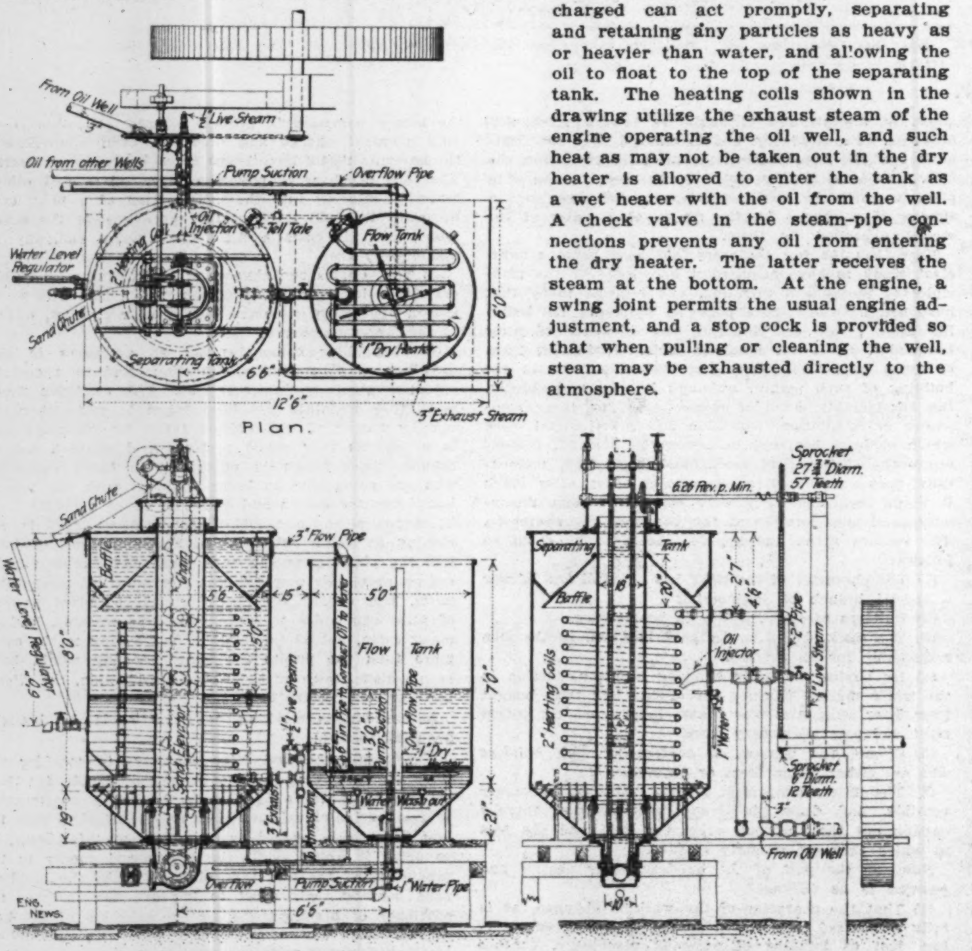
[†] General Manager, Pittsburg Filter Mfg. Co., Pittsburg, Pa.

The average contractor would very much prefer to build his work under the supervision of a trained engineer rather than under the supervision of a shoemaker or blacksmith, and instead of making plans to submit direct, would advocate the employment of an engineer who would assume ground of this character.

I believe this is a condition worth the consideration of engineers who are being retained or seeking retention on work of the character, and that a getting together on some such basis as outlined is the only way to eliminate a considerable percentage of badly designed and constructed plants which are in any case paid for by the client be it a water company or a municipality, irrespective of whether it is an incompetent engineer or a construction company that is at fault.

A NEW CRUDE OIL AND SAND SEPARATOR FOR USE AT OIL WELLS.*

Crude California oil is extremely hard to handle, it is a mucky, viscous, sludge-like substance, containing fixed gases, sand, water, asphaltum, clays and other minerals, in a complete emulsion with the oil, which emulsion is the result of thousands of years of direct contact of the several ingredients under extraordinary heat, pressure and chemical conditions. To treat the crude semi-liquid as fast as it comes from the well, so as to separate these various ingredients, has required much study and experimenting.



OIL AND SAND SEPARATOR. USED IN THE KERN RIVER, CAL., OIL FIELDS.

The present practice of placing the crude oil in sumps having a large area, and allowing exposure to the atmosphere to effect the separation is very slow, imperfect and wasteful. The soil of which these sumps are composed is porous, and the combined loss from evaporation and absorption has been variously estimated at 8 to 20%. Farther losses from overflow, from breakage of the sumps and from fire are frequent, and an appreciable amount of oil adheres to the sand particles which settle in the bottom. Moreover, the construction of the sumps and installation of heaters and pumps is quite expensive, while the heat loss by radiation of steam from long lines of pipe is large. Under ordinary conditions, 1½ barrels of oil are required to heat and pump 100 barrels of oil in such a system.

A separator has been devised by Mr. Linus W. Brown of Bakersfield, Cal., which eliminates these objections and for which simple construction, continuous satisfactory operation and ample capacity are claimed. The accompanying cut shows the machine fitted with automatic sand washer and remover, although, if greater simplicity is desired, the latter arrangement may be dispensed with in favor of a hand-worked, bottom sand-dump. The main features of the apparatus are a separating tank which receives the oil directly from the well, and a flow tank which delivers the clarified product to storage tanks. A gas separator, not shown in the figure, may also be attached from which any gas entrained by the oil may be drawn off in fit condition for use in the furnace.

SEPARATING TANK.—The connection to the oil injector can be arranged to receive oil from more than one well. The injection nozzle is slotted so as to divide the oil into a thin layer in order that the hot water upon which it is discharged can act promptly, separating and retaining any particles as heavy as or heavier than water, and allowing the oil to float to the top of the separating tank. The heating coils shown in the drawing utilize the exhaust steam of the engine operating the oil well, and such heat as may not be taken out in the dry heater is allowed to enter the tank as a wet heater with the oil from the well. A check valve in the steam-pipe connections prevents any oil from entering the dry heater. The latter receives the steam at the bottom. At the engine, a swing joint permits the usual engine adjustment, and a stop cock is provided so that when pulling or cleaning the well, steam may be exhausted directly to the atmosphere.

A constant water level is automatically maintained by an adjustable regulator which removes surplus water coming from the well or from the condensed steam entering as a wet heater. The baffle, seen near the top of the tank, stops any particles of sand which may rise with the oil and affords the latter a comparatively quiet space in which, before the oil passes into the flow tank, the sand is precipitated. The sand les back into the separator, falls through the ter, and, reaching the bottom, is finally rem d. This tank is made of No. 7 sheet steel. general arrangement of water injection jets, ter level regulator, dry heater, oil injection zle, expansion space and sand baffle, elevat and discharge is readily seen from the draw g.

FLOW TANK.—From the separatin ank the oil is led through a 6-in. tin pipe to e lower part of the flow tank, which contains t water for the purpose of assisting the de ition of such fine particles of foreign matt as may still have been retained in the oil. e clean oil rises to the mouth of the suction p , shown in the figure, and is pumped to st ge. The flow tank is made of No. 16 galvan ed iron. The pump is single acting, 4 × 10 in. 5 × 10, connected by a pipe with a knuckle int and grip to the walking beam.

HEATING.—The most favorable te perature for the work of the separator, on oil having a specific gravity of 0.973, is found by experience to range from 180° to 185° F. The heat is adjusted according to the volume of oil pumped through the system; if the temperature is too high, some of the exhaust steam is permitted to escape to the atmosphere; under the opposite conditions, additional live steam is injected. The exhaust of one engine supplies enough heat to clean and store 350 to 400 bbls. per 24 hrs. With the addition of live steam, this amount can be raised to 700 bbls. per 24 hrs.

CLEANING.—The separator with automatic sand elevator requires no attendance, as the constant stirring in the hot water at the bottom of the tank efficiently washes and stirs the sand, removing it as fast as it falls to the bottom. In the simpler type of machine, about 1½ cu. yds. of sand accumulate in from 2 to 12 hours, when it is dumped by an attendant opening a valve which allows water to flow through the sand from a number of jets provided. A lever is then pulled, opening the main sand valve and allowing the accumulation to pass out. The flow tank is provided with eight jets through which water can be allowed to flow against the sloping sides of the tank and wash away all settled impurities. This is necessary about once in 24 hrs. and requires but a few minutes.

Some of these machines have now been in operation for 17 months in the Kern River, Cal., oil fields and are giving entire satisfaction.

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*Prepared from information furnished by Mr. Linus W. Brown, M. Am. Soc. C. E., Bakersfield, Cal., R. F. D. No. 1.

FAILURE OF A WATER TANK TOWER.

By W. H. KELLOGG, Jr.*

In the failure of a water tower at the Kent County Poor Farm, near Grand Rapids, Mich., on Aug. 23, two lives were lost. The following gives particulars of the accident. The names of the parties concerned are omitted, in order to give greater prominence to the facts by removing the personal element.

A local concern took the general contract for a heating system for the Kent County Poor Farm. It subcontracted the design and erection of a tower, to carry a water tank, to Bridge Company A, who in turn were furnished with plans for the structure by the Bridge & Iron Company B. Mr. C., acting as consulting engineer for the county, with power to reject or condemn any part of the system, drew general specifications for the tower; these called for an all-steel structure, to conform to "Manufacturers' Standard Specifications," to be designed for a wind pressure of 30 lbs. per sq. ft. with the tank filled and a maximum stress in the steel of 16,000 lbs. per sq. in. of net section, the factor of safety to be four.

The height of the tower was 80 ft. 5 ins., in five panels; width at the bottom 22 ft.; width at the top 13 ft. 6 ins. On top of the tower rested a wooden tank containing 31,500 gals. of water, bottom and sides of 2¾-in. cypress, with 16 1-in. and 4 ¾-in. round iron hoops. This tank rested on 5-in. 9¼-lb. I-beams for floor joists, which distributed the load to four 12-in. 31½-lb. I-beams connecting the tops of the four posts of the tower. The joists were so arranged that three-tenths of the total load went to each of two opposite 12-in. beams; it was one of these that broke.

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*Consulting Engineer, Houseman Bldg., Grand Rapids, Mich.

The total load on the large beams of the floor was:

Water	262,500 lbs.
Tank	15,000 lbs.
Joists	825 lbs.
Total	278,325 lbs.

Three-tenths of this, or 83,500 lbs., was distributed on the beam in question. This load gives a moment of 83,500 × 13 × 12 ÷ 8 = 1,628,325 in.-ins., which, divided by the 16,000-lb. unit-stress, gives a section modulus of 101.8 ins^3. This would require a 15-in. I beam, 80 lbs. per ft. The section modulus of the beam used is 36.0 ins^3., which gives for this load a unit-stress of 45,230 lbs., much in excess of what is safe, even exceeding the elastic limit.

To make the matter worse, the plans show that the lower flange of the beam had four 11/16-in. holes (to fasten brace for footpath) at a distance of 3 ft. 9 ins. from each end; this would increase the extreme fiber stress of the bottom flange practically to its breaking point.

These figures are without regard to wind stresses, which would make the showing worse.

The beam broke through the rivet holes just mentioned, at 3 ft. 9 ins. from one end. It tore evenly and clean through the bottom flange up to the top flange, the tear then running lengthwise of the beam for about 3 ins. in the web underneath the top flange. The top flange bent into a 90° bend and shows no crack.

The break caused the immediate collapse of the whole floor system, precipitating the whole tank to the ground. Measurements of the beam at the break show perceptible stretching and a reduction of area of 10%. That this reduction of area is small is evidently due to the fact that the rupture came suddenly.

It does not seem possible that such designing could come from a bridge shop, be passed on by another bridge company, and be accepted by a professed Consulting Engineer. For if any one of these were either unable or unwilling to figure the stresses, one glance at a steel mill handbook would have sufficed to show, in a way that even a layman could understand, that the maximum safe distributed load on a 12-in. 31½-lb. I-beam on a 13-ft. span is 14¾ tons, and that 83,500 lbs. or 41¾ tons as a distributed load acquires a 15-in. 80-lb. I-beam for a fiber-stress of 16,000 lbs. This is read from tabulated self-explaining data, and requires neither time nor technical knowledge.

The matter at present is before a Coroner's jury in Grand Rapids, who are endeavoring to fix the blame for the death of two men working on the tower, who were killed in the collapse. The consulting engineer for the county in this work admits that he had put his O. K. on the plans, supposing the beams were all right, but claims he had never seen any details of the tower showing the size of this beam, as was evidently his duty. The contractors for the heating system, however, claim to have furnished such detail plans to him together with bills covering the steel material, which he accepted. When asked as to his opinion for the reason of failure, Mr. C. replied that he thought the steel was defective. If an analysis does show poor steel and the jury on this basis acquits C. and does not investigate further his neglect or error, the writer believes the bridge company which designed this flimsy structure, figuring steel to its breaking point and claiming a large factor of safety for it in order to reduce weights and "get the job," should be criminally prosecuted. That kind of business should be stopped.

* * *

THE GUN SILENCER invented by Mr. Hiram P. Maxim was tested by a board of officers of the U. S. Army, at Springfield, Mass., Sept. 3. It is reported that the discharge of a gun fitted with the silencer was inaudible at 250 yds. In performing the test, the officers went to the rifle butts while Mr. Maxim, with an assistant to fire the gun, moved in an automobile from point to point at different distances from the butts. In no case was the board able to determine with unanimity the direction of the shots, being compelled to judge from the whirr of the bullet alone.

A SIMPLE METHOD OF CLEANING GAS CONDUITS.*

By W. D. MOUNT,† M. Am. Soc. M. E.

Three years ago, the writer had occasion to ask for proposals on a battery of gas producers, including the design of the distributing conduit and branches, though the latter were to be built under separate contract and by parties other than the contractors for the producers.

As the producers were to supply gas to furnaces in continuous operation over long periods, which, for efficient working, required very uniform conditions of heating, the question of an uninterrupted flow of gas of uniform quality became of exceptional importance. We found that all of the builders of producers whom we asked to submit specifications and quotations could, in a general way, meet the conditions of uninterrupted service; that is, it would be necessary to shut the gas off a few hours once each week, and clean the accumulated soot out of the conduits.

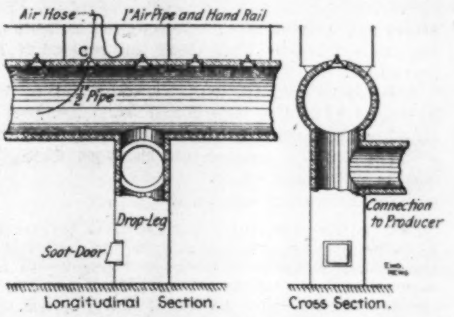

Fig. 1. Main Gas Conduit Arranged for Cleaning While in Operation.

Our idea of continuous service was somewhat different. It did not mean shutting down once a week, or once each month, but meant a condition of operation absolutely without interruption for an indefinite period, and we finally made this a condition of our acceptance of the contract. The installation was to be in a department already in operation for several years, and where the use of gas was not originally contemplated. Therefore, the distributing conduits had to be designed to meet existing conditions of space and apparatus in a department already so much overcrowded that a duplicate system of conduits, one to be in use while the other was being cleaned, was entirely out of the question, to say nothing of the greatly increased cost of installation. Designs for such a duplicate system were submitted by one builder as the only possible solution of the condition of uninterrupted service.

In placing the contract, our decision was not based altogether on the merits of the different producers offered, but largely on the method or system of cleaning, and a design of distributing conduits which seemed to provide the greatest facilities for meeting the imposed condition of uninterrupted service. After carefully canvassing the designs submitted, a contract was placed with the Morgan Construction Co., of Worcester, Mass., through their engineer, Mr. E. A. W. Jeffries, M. Am. Soc. M. E., who, to quote from one of his letters, was

> confident a method of cleaning the conduits, which, because of conditions imposed, was the most important function to be provided for adequately, could be worked out, but which required special study, and which involved some features not heretofore fully developed.

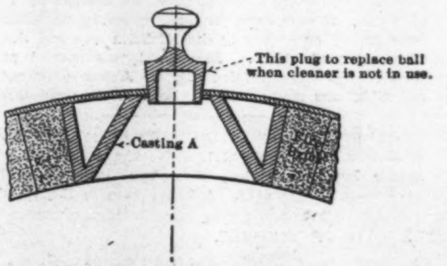

Fig. 2. Cleaning Hole Casting.

I may say, at this point, that the congested condition of the department in which the producer plant was to be installed, as well as the location of existing apparatus, precluded the possibility of using underground conduits, and made it necessary that an overhead system be adopted, and, as already stated, the lack of room prevented the system from being in duplicate.

The plan of action arranged for, as outlined by Mr. Jeffries, consisted in providing facilities in the way of openings in the conduit for blowing depositions of soot through into the stack, by means of steam jets, connections to the base of the stack being arranged for from each distributing conduit. The above outlined operation was not to occupy more than 15 minutes, during which time the gas was to be shut off, but the heat in the furnace was not to be seriously impaired. The condition of uninterrupted service, it is to be noted, was not fully met, and the writer was confident at the time, and subsequent developments proved his prediction to be correct, that when the gas was shut off, even though as small an amount of time as 15 minutes, it meant shutting off the product from the furnaces, or, in other words, it meant an absolute shut down of the department during the operation of cleaning.

The producers and distributing conduits, however, were installed as designed, and the proposed method of cleaning put into effect, with the exception that compressed air was used in place of steam. Measured by experience gained, the method was a great success, but as a means of keeping the gas conduits clean, it was a failure.

It did not take long, however, to determine that the idea was all right, and that our lack of success was due to the fact that the facilities provided in the design for applying the air or steam were inadequate, as well as improperly located.

The experience gained in the early days led finally to the development of the system to its present form, which is fully detailed in the accompanying sketches, and which I am glad to report, has been so successful that for the past 18 months we have never for a moment had the gas shut off from our distributing conduits for the purpose of cleaning out the depositions of soot.

The method and apparatus, as will be noted from the drawings, are extremely simple, and quite out of proportion to the results obtained. We have so much confidence in compressed air that we are almost inclined to believe that it is one of the things essential to the successful operation of the method, another being accessibility to the main conduit and its branches. The air should be thoroughly dry and at not less than 80 lbs. pressure. We find in practice that the connections from the conduit to the base of the stack are, for cleaning purposes at least, entirely unnecessary. The only time they are used is in making repairs on the conduits, when they are opened for the purpose of drafting out the gas. We also find that about 75% of the soot is deposited in the drop legs immediately behind the producers, the balance being dislodged by means of the air jet from the brick lining and carried along with the current of gas to the furnaces where it is almost wholly consumed.

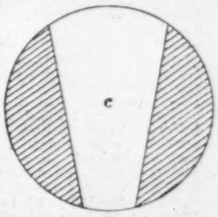

Fig. 3. Section of Swivel Ball for Air Pipe.
(Half size.)

Referring to Fig. 1, A A are openings in specially designed castings (see detail A, Fig. 2) spaced along the top of the conduit, and of the same depth as the brick lining. C is a cast-iron ball of a diameter sufficient to close the opening in A and free to slide on the ½-in. bent pipe B (see detail of C) which is connected by hose to the air main, a 1-in. pipe serving also as one of the hand rails along the top of the conduit.

The openings A A are spaced at a distance nearly equal to the diameter of the conduit (although this spacing is not necessarily fixed), which we have found by experience to be about right for effective work, and in any event they should not be at a distance exceeding 6 ft.

The bent pipe B should be long enough to reach all parts of the conduit from A to A. The pipe, however, for convenience in handling cannot be over 8 ft. and its length, therefore, in a measure, fixes the distance from A to A. Permanently attached to the end of the pipe is a short length of air hose, having attached at the other end the male portion of a standard ½-in. Joy coupling. Located along the hand rail air pipe, at distances from two to three times the distance between A A, are cocks and the female portion of the Joy coupling. Attaching the hose to the air main, therefore, is a very simple matter and consumes a minimum of time.

In cleaning we begin at the producers and work toward the furnaces. To the casual observer it would seem that the operator did nothing more than stick the bent pipe through the opening A and turn on the air. This, however, is, of course, the most insignificant part of the operation. It is necessary that the pipe be given a circular motion, which will bring its discharge end in contact with all parts of the brick lining from one opening to another. A careful, conscientious workman will, in a little time, become very expert in the operation, and when the work is properly done it can be absolutely depended upon to remove all depositions of soot.

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*Presented at the Detroit Meeting (June, 1908) of The American Society of Mechanical Engineers.

†General Superintendent, The Mathieson Alkali Works, Saltville, Va.

In conclusion, it is only necessary to say that the gas is not shut out of the conduit during the operation of cleaning, nor is its flow in any way checked. The producers do not seem to be affected in the slightest degree; in fact cleaning is conducted absolutely without interruption to producers, conduits and furnaces, and that it is efficient is evidenced by the fact that when our conduits have been opened for repairs we have always found them clean to the brick lining.

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TESTS OF TREATED TIMBERS.

Tests of the physical properties of timber that has been treated by preservative processes have been made on an extensive scale during the present year by Mr. Samuel M. Rowe, M. Am. Soc. C. E., Consulting Engineer, of Chicago. These tests were made with over 1,000 blocks (1 × 1 × 4 ins.) in the 20,000-lb. Riehle machine at the Chicago city laboratory. The results have been compiled as a supplement to Mr. Rowe's book on "The Preservation of Timber," and we have been permitted to make some note of these results in advance of their publication. From the detailed reports we have prepared the accompanying tables, as indicating the general results.

Table I. shows the ultimate crushing loads and other properties of some treated and untreated specimens. White oak from ties that had been in use on a Chicago street railway for 15 years gave a crushing strength of 5,339 lbs. per sq. in., as against 6,900 lbs. for new white oak. Untreated pine from ties that had been 15 years in concrete showed a strength of nearly 4,200 lbs. As to the effect of over pressure on the timber, Mr. Rowe states as follows:

> When the treatment of ties by the Wellhouse process in 1885 was commenced, the rule was laid down that no more than 100 lbs. per sq. in. should be allowed on the charge while in contact with the solution. This was accepted on the authority of Mr. Wellhouse, Mr. Jos. P. Card and Mr. Chanute, and has been the practice with either the zinc-tannin or the Burnett process (with slight allowable deviation) since that time. This was derived from past experience and was accepted as being correct, the general opinion being that a pressure much above this would part the timber fiber.
>
> The writer in making some experiments on the possibility of impregnating wooden paving blocks with melted asphalt in combination with creosote oil, found it impossible to make it reach all parts of a 4-in. block unless a much higher pressure and a high degree of heat was used. In some cases where a 300-lb. pressure was applied, the grip of the hand would cause the oil to protrude at the end of the surface of the block long after removal from the retort.
>
> Recently, however, this idea that the higher pressure does so injure the timber has been emphatically denied, and the practice at some creosoting plants is to use twice that pressure or more. With a view to aid in correct determination of the question, the writer has gone to some trouble to gather information on the subject.

Table II. summarizes the results of tests on the absorptive properties of timber. The treated specimens were thoroughly dried before being immersed in water. The white oak ties had been in use for 15 years and while a part had rotted away, the sound timber was almost as good as new.

For the experimental treatment of hard-maple paving blocks with creosote, and with a mixture of creosote and asphalt (mentioned in the above statement by Mr. Rowe), the results may be summarized as follows, the pressure in each case being 100 lbs. per sq. in.:

The blocks treated with creosote averaged 45.94 lbs. per cu. ft. before treatment and 63.23 lbs. after; the minimum and maximum weights for the treated blocks were 62.12 lbs. and 65.24 lbs. per cu. ft.

The blocks treated with creosote and asphalt averaged 45.34 lbs. before and 51.35 lbs. per cu. ft. after treatment; the minimum and maximum weights for the treated blocks were 47.28 lbs. and 54.36 lbs. per cu. ft.

TABLE II.—ABSORPTION TESTS OF TIMBERS.

Timber and Treatment.	Weight lbs. per cu. ft.	Spec. Gr.	Absorption, per cent. of volume. 1 day.	14 days.	30 days.
Red oak, zinc-creosote, steamed	48.5	.778	.091	.193	.357
Red oak, zinc-creosote, not steamed	42.3	.679	.126	.194	.292
Red oak, untreated (partly seasoned)	55.3	.887	.087	.176	.234
Burr oak, zinc-creosote, steamed	53.1	.851	.046	.109	.150
Burr oak, zinc-creosote, not steamed	52.7	.845	.054	.127	.172
White oak, untreated	40.5	.648	.093	.179	.261
White oak, untreated	50.5	.810	.066	.173	.284
Pine, zinc-creosote, steamed	30.4	.487	.056	.147	.201
Pine, zinc-creosote, not steamed	28.6	.459	.046	.119	.193
Pine, coal-tar residuum	33.6	.539	.030	.126	.195
Pine tie, untreated	27.5	.440	.125	.242	.301
Yellow pine, paving block, creosoted	62.9	1.000	.051	.101	.152
Cypress, zinc-creosote, steamed	27.9	.447	.112	.241	.321
Cypress, zinc-creosote, not steamed	30.8	.494	.068	.139	.216

TABLE I.—TESTS OF STRENGTH OF TIMBERS.

Timber and Treatment.	Weight lbs. per cu. ft.	Spec. Gr.	Absorp. in 30 days P. ct. of Vol.	Ultimate Crushing Load lbs. per sq. in. Column.	Flat.	Edge.	Diag.
Red oak, untreated (heart)	33.3	.550	.144	6,477	1,045	1,207	....
Red oak, untreated (sap)	33.2	.532	.143	5,914	....	....	1,025
Red oak, zinc-creosote, steamed	48.5	.778	.236	6,228	1,071	960	....
Black oak, zinc-creosote, steamed	53.7	.861	.210	5,604	....	....	1,700
Burr oak, zinc-creosote, not steamed	52.7	.848	.158	5,176	....	....	1,500
White oak tie, untreated, green	52.6	.843	.290	6,910	1,750	1,525	....
White oak tie, untreated, 15 years in sandy soil	42.4	.680	.200	4,417	1,462	1,447	....
White oak tie, untreated, 15 years in wet soil	46.5	.745	.239	5,339	1,167	1,165	....
Maple, hard, untreated	....	....	....	7,887	1,897	1,280	....
Maple, hard, creosoted	46.0	.738	....	5,506	2,125	1,300	....
Maple, hard, creosoted	49.8	.797	....	6,380	1,707	1,395	....
Maple, hard, creosoted, 100-lb. pressure	62.5	1.003	....	5,506	2,135	1,300	....
Maple, hard, creosoted, 100-lb. pressure	66.5	1.066	....	6,380	1,707	1,395	....
Maple, hard, creosoted, 500-lb. pressure	....	....	....	6,070	....	....	....
Maple, hard, zinc-creosote, 500-lb. pressure	....	....	....	5,236	....	....	....
White pine, zinc-creosote, not steamed	28.6	.459	.163	5,938	1,367	1,205	....
White pine, zinc-tannin, 12 years in bridge	25.3	.407	.210	4,526	572	535	....
White pine, zinc-tannin, 12 years in bridge	24.7	.396	.272	4,616	537	605	....
Southern yellow pine, creosoted (pav. block)	63.27	1.014	.099	6,122	710	887	....
Southern yellow pine, untreated	....	....	....	4,534	797	1,313	....
Southern yellow pine, untreated	....	....	....	6,199	760	1,025	....
Pine, N. Mex., zinc-tannin (old tie)	28.7	.461	.469	5,227	967	770	....
Pine, N. Mex., zinc-tannin (old tie), sap	28.7	.461	.469	3,981	630	642	....
Pine, untreated, in concrete 15 years	27.5	.440	.279	4,166	560	726	....
Cypress, zinc-creosote, not steamed	30.8	.494	.184	3,594	....	....	490

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THE PARIS CENTRAL TELEPHONE EXCHANGE was entirely destroyed by fire Sept. 20. The origin of the fire is ascribed by the Minister of Public Works to a short circuit. The telephone building was comparatively new and was fitted with the central battery system.

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AN EXPLOSION OF BLASTING POWDER in a freight car on the Missouri, Kansas & Texas Ry., at Windsor, Mo., Sept. 15, which resulted in the death of seven persons and injured 15 others, is said to be the result of a practical joke. The freight car containing twelve tin cans each holding 25 lbs. of powder was standing beside the platform of the Windsor station. A freight conductor, to scare the bystanders, threw a lighted match into a pile of loose powder on the platform. The flaring up of this powder is believed to have ignited that in the car. Two men who were in the car were killed outright and five others on the platform were fatally injured and died within a few hours.

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THE WRIGHT AEROPLANE, with which record-breaking flights have been made in the past three weeks, was completely wrecked during an unofficial trial at Fort Myer, Va., on Sept. 17. New propellers had been fitted and it is supposed that a blade of one of these came in contact with a wire guy, breaking both the guy and the propeller. The aeroplane was about 75 ft. from the ground at the time of the accident and control of the machine was not obtained quick enough to glide down to the ground safely. Lieut. Thomas Selfridge, attached to the Signal Corps of the United States Army, who was on the machine with Mr. Orville Wright, was injured so severely that he died in a few hours and Mr. Wright sustained a fractured thigh and several broken ribs.

It is reported that the time allowed by the officers of the Signal Corps for the completion and testing of the machine will be indefinitely extended and that experiments will be resumed on Mr. Wright's recovery.

Mr. Wilbur Wright, on Sept. 21, at Le Mans, France, snatched the world's record from his brother by a flight of 1 hr., 31 min. and 51 sec., covering 98 kilometers (60.8 miles) and winning the Michelin cup and the Aero Club prize of $1,000. This flight was started at 5.15 p. m., after several false starts. About 40 minutes of the flight was made after sundown in the semi-darkness.

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FOREST FIRES CONTINUE TO BURN in Minnesota, Wisconsin, Michigan and Canada, and immense tracts of timber lands in Maine, New York and Pennsylvania have been burned over. A heavy rain in the vicinity of Grand Marais, Minn., Sept. 17, checked the fires in that region but did not entirely extinguish them. In Wisconsin, the towns of Gagen and Woodboro in Oneida Co. are reported to have been destroyed Sept. 20, and Mosinee, Marathon Co., was surrounded by the fires. Several villages in Marinette Co., Wis., and in Dickinson and Menominee Counties, Mich., are in danger. Extensive fires are reported in the province of Ontario along the Ottawa River, and in Quebec.

In Maine forest fires are burning in eight counties and many thousands of feet of standing timber have been lost. The fires in New York are said to be under control although thousands of acres of timber are burning. Reports to the State Forest Department of Pennsylvania show that 100,000 acres of forest land in the central-northern part of the state are being burned over, and 15,000 acres of State Forest Reserves have been burned.

◆

A FIRE IN THE DETROIT RIVER TUNNEL (that is, in one of the twin tubes of the Canadian approach to the river section; see article elsewhere in this issue) occurred early in the morning of Sept. 15. Two men lost their lives. They were not working in the tunnel, but it is stated that they went down to investigate the fire or to ascertain if any men were still in the tunnel, and were overcome by the smoke. One of the men was Mr. W. R. Kimball, an engineer employed as assistant superintendent on the day shift. All the tunnel men escaped through the opposite tunnel and by the elevators and stairways at a shaft near the work. The following is a statement furnished us by Mr. W. S. Kinnear, Chief Engineer of the Detroit River Tunnel Co.:

> The fire started just inside the air-lock in the westbound tunnel, about 1,400 ft. back of the shield. The air-locks are located but a short distance from the portal shaft, where the shields were started. The locks are built in concrete bulkheads within the finished tunnel section. Immediately inside of the lock in the westbound tunnel is a very short section of the crown of the arch which is unfinished, leaving exposed a portion of the arch timbering and a patch of waterproofing which surrounds the entire arch section outside the concrete.
>
> It is presumed that the fire originated from a lighted match thrown carelessly to one side, or the burning out of a candle thoughtlessly left on some of the timbers. Electric lights are in service throughout the tunnel work, great care being taken with the wiring to avoid interruption in service. As an extra precaution, candles are used only in emergency cases. The tar-paper and coal-tar pitch, of which the waterproofing is composed, became ignited. The air pressure inside the lock where the fire originated drove the fire through the waterproofing between the completed concrete arch and the timbering for the portal shaft, filling it with a dense smoke. The air pressure was relieved as soon as possible and the fire died out.
>
> The escape of the workmen was very simple, as they passed, immediately after being ordered to the surface, through cross passages to the eastbound tunnel and out of the portal shaft. The damage to the property was very slight and the fire was easily smothered during the day. The unfortunate part of the occurrence was the loss of two lives. The workmen and others were in no manner trapped, but of the two who were suffocated, one went back for his coat, and the other (Mr. Kimball) went in with a hose to locate and do what he could to extinguish the fire. The stability of the tunnel is in no manner affected, as the fire was confined to a very small section near the portal shaft.

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THE ANNUAL NEW YORK ELECTRICAL SHOW will run from Oct. 3 to 14 at Madison Square Garden. Among the attractions promised for this popular exhibition will be demonstrations of domestic applications of electricity, electrical cow-milking machines, wireless telephony, electrically-produced music, Edison's cement house, etc., etc. During the exhibition the jubilee of the Atlantic submarine cable will be celebrated.

◆

THE ALASKA-YUKON-PACIFIC EXPOSITION at Seattle, Wash., in 1909, is to be held on a portion of the campus of the State University of Washington, east of 15th Avenue. The grounds are admirably situated, extending to the shore of Lake Washington on the east and to the Lake Washington Canal and Lake Union on the south. They cover an area of between 25 and 30 acres. The general plan is characterized by a number of open circles from each of which extend radial streets or avenues, but this arrangement is not strictly adhered to. The grounds and buildings, the layout of which has been planned by Olmsted Bros., Landscape Architects, and Howard & Galloway, Supervising Architects, are designed to harmonize with those of the University and to accord with the plans for its future development. Illustrations showing three of the exposition buildings which are to be utilized eventually by the University were published in our issue of April 2, 1908, p. 383.

THE INTAKE CRIB for the southwest water supply tunnel at Chicago was sunk in place on Sept. 15. Its construction was described in our issue of Nov. 14, 1907, in connection with the new water tunnels. The contract for the lake section of the tunnel, including the intake crib and its two intake shafts, is held by George W. Jackson, Incorporated, of Chicago.

REFUSE DESTRUCTOR BONDS to the amount of $1,000,000 have been approved by popular vote at San Francisco. It is stated that before the proposed destructors, with sufficient capacity to deal with all the refuse of the city, can be erected and put in operation, it will be necessary to dispose of the franchise now held by the Sanitary Reduction Works. Under this franchise, which was granted a number of years ago, the company built garbage incinerators of the Thackeray type. (See Eng. News, May 17, 1900.) This company has the exclusive privilege of destroying all the garbage of the city at a stipulated price per ton, which price must be paid to private scavengers or others bringing garbage to the furnaces. It is said that the city will probably buy the furnaces and other property of the company.

A CONFERENCE OF GOVERNORS of the New England States was recently held at Boston to discuss cooperative measures for the conservation of natural resources, with special reference to forestry, water power, navigation and fisheries. Improved highways and public sanitation, including in the latter the spread of tuberculosis through milk, were also discussed. A general conference on natural resources and allied subjects, at which an extended representation from the New England States will be present, is projected.

A NEW METHOD OF SNOW MELTING by means of a hydrocarbon fluid was described in a paper presented by J. S. Lang, M. Am. Soc. M. E., at a recent meeting of the Railway Signal Association. The practicability of this method, according to Mr. Lang, has been demonstrated by its use for the purpose of freeing switches from snow and ice during the past three winters at one of the busiest terminals in the country. The process is described by Mr. Lang as follows:

> The melting of the snow or ice is effected by applying to it a flaming fluid of special character, which continued to burn while in the snow, melting and finally evaporating the greater portion of it. On account of the special character of the fluid, the flame is easily maintained regardless of the high winds of the storm or the drifting of the snow.
>
> The fluid is applied by the regular track force by means of a safety distributing can, and the height and extent of the flame can be regulated with ease.
>
> No injury to track results from the use of this system, as the temperature of the rails is not raised to the usual summer heat. The fluid is obtainable in the open market at from three to five cents per gallon and may be obtained free of cost by railroads operating their own Pintsch gas plant.

This system is said to be at once more economical and more effective than the common method of "hand cleaning" switches.

BORINGS FOR THE HAUSER LAKE DAM have been reported by the Stone & Webster Engineering Corporation, which, as noted in Engineering News, July 30, 1908, has assumed the construction of a concrete dam to replace the steel one, whose failure was noted in this journal April 30. The borings have been sunk 16 ft. into bed rock and have established the presence of a flinty ledge at an average depth of 55 ft. below normal water level. No deep holes in the ledge have been found. The exact design of dam has not been fixed and further borings are being made to secure additional data. The construction camp has been completed with water supply and proper sanitation. A spur track is being built, from the Montana Central R. R. to the site of the second proposed dam, at Wolf Creek, 20 miles below Hauser Lake.

A TRUNNION BASCULE BRIDGE of 170 ft. span has been completed for the Chicago & Northwestern Ry. at the crossing of the north branch of the Chicago River, near the Wells St. terminal station. It is a double-track bridge of the Strauss type and is said to be the longest single-leaf, double-track, bascule bridge in the country. It is the first of two similar bridges side by side (forming practically one structure) to replace the present double-track, center-pier swing bridge over which all the heavy traffic of this terminal has had to pass. To allow of the erection of the new bridge, the swing bridge was converted into a "bobtail" drawbridge, one end being cut away so as to leave only enough material to carry heavy counterweights. The bascule bridge is now in use, and the swing bridge will be removed to make room for the second bascule bridge.

A LARGE RAILWAY TERMINAL STATION is to be built at Milan by the Italian government, which owns and operates the railways. It will be for passenger and fast-freight traffic. The building and yards will cover a space about 1¼ miles in length and 700 ft. wide. The station will have ticket offices, baggage and customs offices, etc., on the first floor. On the second floor (at the track level) will be the waiting rooms, restaurant and railway offices. The trainshed will have 20 tracks (about 24 ft. above the street), and the roof will have nine spans of 80 ft. each. Baggage will be handled by elevators. The freight station will be under the trainshed; it will be approached by a single track incline for trains, but eight hydraulic elevators will be provided for handling cars between the main lower floor and upper floors in buildings flanking the trainshed. The cost is estimated at about $10,000,000.

A HUMAN DYNAMO, a newspaper wonder living in Houston, Tex., is described in a special despatch to the New York "Times" of Sept. 10. The boy is seven years old and is of Russian parentage. The following truly marvelous description is reprinted from the "Times." It is not stated that the boy's appetite increased after having run the electric fan for several hours, though such might be inferred:

> A metal filling had been put in one tooth, and when the boy came home he picked up the knob used to connect an electric fan with an electric light wire in his mother's residence and thrust it into his mouth.
>
> A threaded metal cap was on the end which screws into the cup for the electric bulb. As the metal cap touched the metal tooth filling the boy's head jerked slightly and the fan began to revolve and then to buzz frantically at full speed. This kept up as long as the circuit was completed in the boy's mouth. A piece of iron held in the boy's hand for a few moments becomes highly magnetized. A hammer with an iron handle held in his hands will attract tacks at a distance of 4 ft. The boy says that he feels only an agreeable sensation. He has hair of the reddest possible hue, large freckles, and blue eyes.

A NATURAL GAS PLANT installed recently developed a considerable flow of water with the gas. This tended to choke the pipes and cause great irregularity of flow. In order to avoid these troubles a horizontal cylindrical receiver was introduced on the pipe line, this receiver being 25 ft. diameter and 60 ft. long over its hemispherical ends. The supply main from the wells enters at one end, above the center line. The gas supply pipe is connected to the top of the receiver, near its farther end. The water collects in the lower part of the receiver and can be blown out through a vertical pipe whose open lower end reaches nearly to the bottom of the receiver.

THE FLOW OF NATURAL GAS in Indiana is recorded as amounting to 20,000,000 cu. ft. daily in the report of the State Natural Gas Supervisor, and the average price is 30 cts. per 1,000 cu. ft. There are 26 counties in Indiana in which natural gas is being produced and used.

WOOD PAVING composed of built-up blocks, 24 × 48 ins., and 5½ ins. thick, is being tried in Chicago. Each block is composed of 24 planks, 1 × 5½ ins., fastened together with two long bolts. The heads of the bolts are countersunk in recesses which receive the nuts of the adjacent block. This arrangement forms a sort of lock joint. The blocks are treated with a pitch composition and coated with sawdust. In laying the pavement, the ground is first leveled and covered with planks treated in the same way as the blocks, which are laid directly upon them. The paving is in use at some of the bridge approaches; also in Dearborn St. in front of the post-office, where the heavy wagons deliver bulk mail from publishing houses and printing offices. This system is the invention of Mr. A. F. Shuman, paving contractor, 88 Washington St., Chicago.

A somewhat similar paving has been in use for some months on the same part of Dearborn St. In this case, the blocks (also 24 × 48 ins.) have rows of wooden paving blocks alternating with the planks, the whole being cemented together by the composition with which the planks and blocks are coated. The blocks do not break joint. They are laid with the 48-in. length transverse to the street, and their ends rest upon lines of planks laid on a bed of sand. The gutters are paved with narrower widths of blocks laid parallel with the curb.

A NOTABLE RECORD for boiler-efficiency is reported from the new power plant and pumping station at Lardner's Point, Tacony, Pa., by the American Blower Co. The boiler tested was one of six in one of the two new boiler plants at Lardner's Point. This plant comprises six, 500-HP. Edgemoor water-tube boilers which are set in batteries of two each and are connected, by underground conduit, to two 150-ft. stacks. The boilers are equipped with Wetzel inclined grate stokers, with a stoker engine to each battery. A description of the system of which this station is a part was given in Engineering News, Aug. 18, 1904.

The test in question was conducted early this year to determine what evaporative results and efficiency the boilers and stokers would show with coal of certain quality, and when operating at a capacity 25% in excess of the builders' rating. The test was conducted in accordance with the code of the American Society of Mechanical Engineers, with a "running start and finish." The usual pressure, draft and temperature readings were taken at intervals of 15 minutes and the results given in the test records are averages. Gas samples were collected and analyzed at intervals throughout the test, the average results of which indicated an air consumption of 17.22 lbs. per lb. of dry coal, and a loss of only 0.29% through incomplete combustion of carbon.

The coal burned was known as "Henrietta," a semi-bituminous fuel from Columbia County, Pa., which analyzed as below:

Volatile combustible	18.75%
Fixed carbon	74.82
Ash	6.43
B. T. U. per lb. dry coal	14,700

The coal gave gray ash and non-fluxing clinker. The following important data for the boiler and furnace were recorded:

Heating surface	5,052 sq. ft.
Width of grate	2 × 6 ft.
Length of grate	8 ft. 6 ins.
Area of grate	102 sq. ft.
Ratio of heating surface to grate area	49.5:1
Duration of test	24 hrs.
Average gage pressure	128.9 lbs
Draft:	
In flue behind boiler	0.628 ins.
In furnace	0.335 ins.
Average temperatures:	
External air	31.35° F.
Feed water	39.2° F.
Flue gases	475.9° F.
Total coal burned	46,750 lbs..
Moisture content	3.56%
Total refuse	3,168 lbs.
Water evaporated:	
Actual total	432.455 lbs.
Total equivalent, from and at 212°	529.714 lbs.
Actual, per lb. dry coal	9.592 lbs.
Equivalent, per lb. dry coal	11.749 lbs.
Equivalent, per lb. combustible	12.637 lbs.
Equivalent, per sq. ft. heating surface per hr.	4.368 lbs.
Average HP. developed (basis 34.5 lbs. water per hr. from and at 212°)	639.74
Capacity (over rating)	128%
Sq. ft. heating surface per HP	7.89
Dry coal burned per hr per sq. ft. grate area	18.41 lbs.
Heat utilized per lb. dry coal	11.396 B. T. U.
Combined efficiency of boiler and furnace	76.82%
Dry coal per boiler HP.-hr.	2.93 lbs.

THE POSSIBLE USES OF SAWDUST are to be investigated by the National Conservation Commission, the headquarters of which are at Washington, D. C. Inquiries bearing upon the subject have been sent to some 500 manufacturers of explosives, pulp woods and like products. Closely related to this particular investigation are other inquiries dealing with the utilization of waste lumber from sawmills and waste materials from mills devoted to cooperage, furniture, box, veneer and other industries. It is interesting to note that the growing scarcity of finishing woods has led to an annual production of over 1,100,000,000 sq. ft. of veneer.

THE RAILWAYS OF NEW SOUTH WALES (Australia) have a length of 3,473 miles, according to the report of the Chief Commissioner of Railways for the year ending June 30, 1908. At that date, 186 miles were under construction and about 400 miles had been authorized. The longest extension is 278 miles, along the east coast from near Newcastle. It will give complete a coast line from Sydney, the capital city, to the northeast point of the boundary separating this colony from Queensland. There were only about 20 miles of railway built during 1907-08.

The cost per mile of railway (including shops, motive power and rolling-stock equipment) has been $65,780. The earnings for the year 1907-08 were $24,720,680, and the operating expenses represented 54.91% of this total. Of these expenses, 23% was for maintenance-of-way and structures, 46% for maintenance of equipment and 27% for conducting transportation. There were 47,487,030 passengers carried, 9,719,840 tons of freight, and 455,549 tons of live stock. The train mileage was 14,251,052.

A rather remarkable statement in this report, as to the safety of travel, is that during the past seven years only one passenger was killed owing to accidents to passenger trains. The total number of passengers carried during that period was 258,620,836. The non-fatal accidents have increased, but they are generally trivial, and 92% are said to be due to the carelessness of the persons injured.

The street, suburban and interurban lines (or "tramways") aggregate 133 miles, with over 20 miles of extensions authorized and under construction. The operating expenses represent 79.95% of the carryings. The cost per mile for these lines (including shops, power-houses and equipment) is $140,600. There were 172,020,932 passengers carried, with a car mileage of 17,521,410. There are 5,047 employees. There are two lines operated by electricity, having 90 miles of line and 146 miles of track. There are also six lines operated by steam motors. These are nearly all single track and aggregate 42 miles.

These railways and street railways are owned and operated by the colonial government, their operation being under the direction of Mr. T. R. Johnson as Chief

Commissioner for Railways and Tramways. Mr. James Fraser is Engineer-in-Chief of Existing Lines; Mr. W. Thow, Chief Mechanical Engineer; Mr. G. R. Cowdery, Engineer for Tramways, and Mr. O. W. Brain, Electrical Engineer.

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THE PRODUCTION OF GOLD AND SILVER in California in 1907 reached a total value of $17,479,574, according to a recent statement made by the mines to the U. S. Geological Survey. This was a decrease of $2,070,708, as compared with the gold and silver output of 1906. The statement shows a total of 809,214 fine ounces of gold produced in 1907, with a value of $16,727,928, and 1,138,858 fine ounces of silver valued at $751,646.

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THE ADDITIONAL COST OF CITY WATER-SUPPLIES, on account of providing water for fire protection, is to be investigated by the Technologic Branch of the U. S. Geological Survey (H. M. Wilson, Chief Engineer) in behalf of the Commission on the Conservation of Natural Resources. A list of questions has been prepared, soliciting information on the extra cost for the purpose named, divided into cost due to increased volume of water-supply and increased size of water mains, additional hydrants, etc.

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A NEW DESIGN OF STREET CAR operated on the prepayment idea has been placed in operation in Montreal, Canada. The car is described in the "Railway and Engineering Review" of Sept. 19. The platform for entrance and exit is located about two thirds of the car length back from the front. There are no front or rear platforms as ordinarily seen, although there is a single exit door near the front on the motorman's right. The passengers enter the central platform and after depositing their fare in the usual fare-box pass forward or to the rear as they choose. The rear compartment is designated for smokers and it is hoped to eliminate the trouble found with the first prepayment-type cars through the lack of provision for persons who wished to smoke. The exit doors are operated by the conductor through a compressed-air mechanism.

PERSONALS.

Mr. M. H. A. Hoy, M. Inst. C. E., has been appointed Manager of the Imperial Locomotive Co., of Montreal, Que.

Mr. Alfred D. Ludlow has been appointed Assistant City Engineer of Kansas City, Mo., to succeed Mr. W. J. McEllerren.

Mr. A. H. Gairns, Master Mechanic of the Rio Grande Western Ry., at Salt Lake City, has resigned to take a similar position with the Oregon Short Line R. R., at Pocatello.

Mr. Frank Howard, Division Master Mechanic of the Wabash R. R. at Toledo, Ohio, has resigned to engage in private business. He will be succeeded by Mr. Charles Anderson.

Mr. David A. Watt, M. Am. Soc. C. E., and Mr. G. F. Stickney, M. Am. Soc. C. E., of the engineering staff of the New York State Barge Canal, have been appointed Supervising Engineers.

Dr. Edward P. Hyde, of the U. S. Bureau of Standards, has been chosen to organize and direct a department of physical research under the auspices of the National Electric Lamp Association of Cleveland, Ohio.

Mr. William M. Duane, Chief Engineer of the Cleveland, Cincinnati, Chicago & St. Louis Ry., has resigned, to become Vice-President and General Manager of the Walsh Construction Co. His resignation is to take effect Nov. 9.

Professor Carl C. Thomas, until recently head of the Department of Marine Engineering in Sibley College, Cornell University, has been appointed Chairman of the Department of Mechanical Engineering in the University of Wisconsin. He will begin work in the new position with the opening of the coming term.

Mr. Frank Rhea, Engineer of Maintenance-of-Way of the Pennsylvania Lines West of Pittsburg, at Logansport, Ind., has resigned. He will be succeeded by Mr. F. H. Watts who has formerly occupied a similar position at Indianapolis. Mr. D. P. Beach, Engineer of Maintenance-of-Way of the Cincinnati & Muskingum Valley R. R., has been appointed to succeed Mr. Watts at Indianapolis.

Obituary.

Eagleton Hanson, for the past 29 years Secretary of the Trenton Iron Co., died in Trenton, N. J., Aug. 27. Mr. Hanson was born in England in 1842.

Theodor Peters, secretary and manager of the Verein Deutscher Ingenieure, died at Berlin on Sept. 2, in his 67th year. In his position as "Direktor" since 1892 he had been virtually in complete charge of the affairs of the German society, being at the same time editor-in-chief of the society's organ, the "Zeitschrift des Vereines deutscher Ingenieure."

John K. Cooke, formerly Superintendent of the Passaic Steel Co., died Sept. 16 of apoplexy at his home in Paterson, N. J. Mr. Cooke was born in Scranton, Pa., in 1857. His family moved to Paterson in 1868 and he was educated at the Tallman Seminary. He entered the drafting department of the Paterson Rolling Mill Co., which had been organized by his father, and soon became Superintendent. He held this position until 1905 when he organized the firm of John K. Cooke & Sons, structural steel contractors.

W. R. Kimball, Assistant-Superintendent for Butler Bros. & Hoff, the contractors for the Detroit River tunnel, lost his life in a fire in the Canadian approach of that tunnel on Sept. 15. He was not on duty at the time, but after the men had come out he went in with a hose to help extinguish the fire, and was overcome with the smoke. He was a son of Mr. Geo. H. Kimball, M. Am. Soc. C. E., of Detroit. He was employed by the Detroit River Tunnel Co. when the work was started, but afterwards took a position with the contractors.

Irving T. Farnham, M. Am. Soc. C. E., City Engineer of Newton, Mass., committed suicide by hanging, Sept. 19, at his home in West Newton. He had, for several months, suffered at times from heart trouble and this is the only explanation offered for his suicide. Mr. Farnham was born in Deposit, N. Y., in 1869. His early education was received at the Deposit Academy, and, in 1888 he entered Cornell University. After receiving his degree, in 1892, he worked for a few months as a draftsman for the Elmira Bridge Co. and afterward became an assistant in the office of the City Engineer of Newton. In 1899 he was First Assistant Engineer of the Massachusetts Highway Commission and in 1900 was appointed to the position which he held at the time of his death. He is survived by his wife and two children.

ENGINEERING SOCIETIES.

COMING MEETINGS.

LEAGUE OF AMERICAN MUNICIPALITIES.
Sept. 30-Oct. 2. Annual convention at Omaha, Neb. Secy., John MacVicar, Des Moines, Iowa.
AMERICAN INSTITUTE OF MINING ENGINEERS.
Oct. 1. Annual meeting at Chattanooga, Tenn. Secy., R. W. Raymond, 29 West 39th St., New York City.
ILLUMINATING ENGINEERING SOCIETY.
Oct. 6-7. Annual convention at Philadelphia, Pa. Secy., Van Rensselaer Lansingh, Engineering Societies' Building, 33 West 39th St., New York City.
AMERICAN STREET AND INTERURBAN RAILWAY ASSOCIATION.
Oct. 12-16. Annual convention at Atlantic City, N. J. Secy., B. V. Swenson, 29 West 39th St., New York City.
RAILWAY SIGNAL ASSOCIATION.
Oct. 13-15. Annual meeting at Washington, D. C. Secy., C. C. Rosenberg, 12 North Linden St., Bethlehem, Pa.
ASSOCIATION OF RAILWAY SUPERINTENDENTS OF BRIDGES AND BUILDINGS.
Oct. 20-22. Annual convention at Washington, D. C. Secy., S. F. Patterson, Boston & Maine Ry., Concord, N. H.
AMERICAN SOCIETY OF MUNICIPAL IMPROVEMENTS.
Oct. 20-23. Annual meeting at Atlantic City, N. J. Secy., A. P. Folwell, 239 West 39th St., New York City.
AMERICAN GAS INSTITUTE.
Oct. 21-23. Annual meeting at New York City. Asst. Secy., W. Bissell, 29 West 39th St., New York City.
AMERICAN ELECTROCHEMICAL SOCIETY.
Oct. 30-31. Fall meeting at New York City. Secy., Dr. J. W. Richards, Bethlehem, Pa.
ROADMASTERS AND MAINTENANCE-OF-WAY ASSOCIATION OF AMERICA.
Nov. 10-12. Annual meeting at Milwaukee, Wis. Secy., W. E. Emery, West Chicago, Ill.
AMERICAN RAILWAY ASSOCIATION.
Nov. 18. Annual meeting at Chicago, Ill. Secy., W. F. Allen, 24 Park Pl., New York City.
SOCIETY OF NAVAL ARCHITECTS AND MARINE ENGINEERS.
Nov. 19-20. Annual meeting at New York City. Secy., W. J. Baxter, 29 West 39th St., New York City.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS.—The October meeting will be held in the Auditorium of the Engineering Societies' Building, 33 W. 39th St., New York, Oct. 9. A paper entitled "High Potential Underground Transmission," by P. Junkersfeld and E. O. Schweitzer, of the Commonwealth Edison Co., Chicago, will be presented and discussed.

AMERICAN STREET & INTERURBAN RAILWAY ASSOCIATION.—At the annual convention in Atlantic City, N. J., Oct. 12-16, the Engineering Association will hold its Tuesday and Wednesday sessions in the Aquarium Court Hall and its Friday session in the Greek Temple. Thursday has been set apart for the inspection of the exhibits. The Manufacturers' Association is making preparations for an exhibit which will cover the entire area of Young's New Million Dollar Pier, on which 150 different companies have already been assigned exhibit space.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—The season of professional meetings will be opened on Tuesday evening, October 13, by a meeting of the Gas Power Section, in the Engineering Societies' Building at 29 West 39th St., New York. [illegible] will be a discussion of standards to be used in gas [illegible]er work. Two papers will be read, one by E. A. H[illegible]y on gas producer plants, with data upon costs, performance, etc.; and one by N. T. Harrington, giving the results of tests to determine the loss of fuel weight in a freshly charged producer, due to increase of ash contents in the fuel bed. The first paper will be illustrated by lantern slides, showing actual plants and plans for the arrangement of apparatus.

RAILWAY SIGNAL ASSOCIATION.—At the September meeting, held in Chicago, a report of the Committee on Standards was discussed. The report recommended the use of galvanized pipe for connections as being safer and more economical than ordinary pipe. While the latter can be preserved by proper painting the usual experience is that the pipes are not kept in good condition as to painting. The report also presented a new design of compensator crank for pipe lines, as it is found that the present design is not effective.

A paper on "Practical Snow Melting," by Mr. James S. Lang, was read by the secretary in the absence of the author. The method described has been used for the protection of switches and switch and signal apparatus in the passenger terminal yards at New York and Boston. The figures given estimated the cost for clearing snow from a large yard at $1,011 for hand work and $264 for the heating system. This made no allowance for the initial cost of the plant.

CENTRAL STATES WATER-WORKS ASSOCIATION.—The 12th annual convention of the association was held at Pittsburg, Pa., Sept. 15-17, with Mr. John Langan, of Tipton, Ind., as presiding officer. Some half-dozen papers were read, and a number of trips were made to industrial plants in Pittsburg, besides interesting visits to the water purification works of both Pittsburg and McKeesport. There was a fair attendance of members and guests from a number of States of the Central West, and also a considerable exhibit of water-works appliances.

Mr. Alexander Potter, of New York City, presented a paper on water softening, which included a description of the plant now nearing completion at McKeesport, Pa. This plant will not only soften the water, but will clarify it. In addition to views in connection with his paper, Mr. Potter showed a number of lantern slides secured on a recent trip abroad, most of these being views of sewage-purification works.

Another paper illustrated by lantern slides was one on pumping water by gas. This was presented by Mr. J. R. Bibbins, of the Westinghouse Machine Co., East Pittsburg, Pa. Steam turbines were also discussed in this paper, particularly for use where the service is intermittent. Speaking again of the use of gas as a fuel for pumping, Mr. Bibbins said that in the Pittsburg natural gas country there were many such plants which showed remarkable economy. He cited three where the gas consumption averages about 30½, 15 and 17½ cu. ft., respectively, per 1,000,000 gals. pumped under the best conditions, working under heads of approximately 90, 135 and 125 lbs., respectively.

The relation of engineers to the design of mechanical filtration plants was discussed at length by Mr. F. B. Leopold, General Manager of the Pittsburg Filter Manufacturing Co. An abstract of this paper appears elsewhere in this issue.

Notes on cleaning water mains at Pittsburg were presented by Mr. C. O. Dauchaday, Assistant Engineer of the Pittsburg Water-Works.

A number of stretches of pipe, mostly of small diameter, have been cleaned within the last two years, giving rise to discharge increases of from 64% to 564%. The author stated that a better way of expressing the results of cleaning would be to give the percentages of maximum carrying capacity of the mains before and after cleaning. This might be done if only pitometer taps were inserted when mains were laid, and their carrying capacities determined then and at subsequent intervals. Hatch boxes for introducing cleaning machines should also be inserted when pipes were laid.

Mr. R. Winthrop Pratt, Chief Engineer of the Ohio State Board of Health, presented a paper on the value of sanitary laws in the protection of water supplies. After pointing out that recourse to common law did not afford an adequate protection of water-supplies—as is evidenced by the fact that a large number of States have passed special laws bearing on the subject—Mr. Pratt outlined the law passed by the Ohio Legislature last winter. (See Eng. News, April 9, 1908.)

Other papers presented were "Some Experiences with Small Water-Works in Filtering Ohio River Water," by Wilbur Schofield, Superintendent, Benwood, W. Va.; and "Boiler Incrustation," by The Arrow Boiler Compound Co., of St. Louis, Mo.

The convention of 1909 will be held at Columbus, Ohio. The leading officers elected for the ensuing year were as follows: President, William Schwertfeger, City Water Board, Wheeling, W. Va.; Vice-President, T. H. Verner, Water Department, McKeesport, Pa.; Secretary, William Allen Veach, Newark, Ohio; Treasurer, A. W. Inman, Massillon, Ohio.

CONSTRUCTION NEWS

Supplement to ENGINEERING NEWS. 220 Broadway, New York, September 24, 1908.

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CONSTRUCTION NEWS.

PLANS AND SPECIFICATIONS ON FILE.

(denotes that this work is advertised in Engineering News.)*

The following Plans (P.) and Specifications (S.) are on file and may be seen at the office of The Engineering News Publishing Co., 220 Broadway, New York.

Bids close.	Work. Place.	See issue.
9-27	*Quarters, Ft. Hancock, N. J. (P. & S.)	9- 3
9-28	*W-Works, Verona, N. J....(S.)	9-24
9-29	*Sewer, West Point, N. Y.(P. & S.)	9-24
9-29	*Sewers, Oxford, O.............(S)	9-24
9-30	*Dredging, Norfolk, Va......(S.)	9-10
10- 3	Laundry (Mfg. Pl.), Norfolk, Va. (S.)	9-17
10- 3	Alternators, Washington, D. C. (S.)	9-17
10- 5	*Rock excavation, Boston, Mass.(S)	9-10
10-8	*Lift bridge, Wash., D. C.......(S.)	9- 3
10- 9	*Wharf, seawall, Mobile, Ala. (S.)	9-10
10-10	*Steel stack, boilers, Boston, Mass. (S.)	9-17
10-30	Pipe, Passaic, N. J.........(S.)	10-17
12- 1	Dredging, Hawaii ....(S.)	9-17

LIST OF CONTRACTS PENDING.

LIGHT, HEAT AND POWER PLANTS.

9-26	Lighting, etc, Canandaigua, N. Y.	9-24
9-28	*Elec. equipment, Toronto, Ont.	9-10
9-28	Light plant, Boissevain, Man.	9-17
9-30	Boilers, etc., Phoenix, Ariz.	9-10
10- 3	Alternators, Washington, D. C.	9-17
10- 5	Elec. equip., Victoria, B. C.	9-17
10 -8	*Cable. etc., Boston, Mass.	9-10
10-17	Lighting fixtures, Wash., D. C.	9-24

BRIDGES.

9-25	Bridge, Meridian, Miss.	9-24
9-25	Bridge, Cincinnati, Ohio	9-10
9-26	Bridge work, Cleveland, Ohio	9-10
9-26	Bridge, Norristown, Pa.	9-17
9-28	Bridge work, St. Clairsville, Ohio.	9-10
9-28	Abutment, Philo, Ohio	9-10
9-29	Bridge, Little Falls, Minn.	9- 3
9-30	Bridge, etc., Cleveland, Ohio	9-10
9-30	Bridge, Ashland, Ohio	9-17
10- 1	Superstructures, Albany, N. Y.	9-10
10- 1	Bridge, Stanford, Ky.	9-10
10- 1	*Viaduct, Cincinnati, Ohio	9-10
10- 3	Bridge, Urbana, Ill.	9-24
10- 3	Bridges, etc., Pawhuska, Okla.	9-24
10- 3	Bridge work, Cleveland, Ohio	9-17
10- 5	Bridges, Chickasha, Okla.	9-24
10- 5	Abutments, Toledo, Ohio	9-24
10- 5	Bridge, Gaffney, S. C.	9-24
10- 5	*Bridge plans, etc., Austin, Tex.	9-10
10- 6	Bridge, L'Original, Ont	9-10
10- 6	Bridges, Stockton, Cal.	9-17
10- 6	*Bridge, Ottawa, Ill.	9-17
10- 8	*Lift bridge, Wash., D. C.	9- 3
10- 9	Bridge, Cincinnati, Ohio	9-17
10- 9	Bridge, Madisonville, Ohio	9-24
10- 9	Bridges, Manhattan, Kan.	9-24
10-12	*Superstructure, Cincinnati, Ohio.	9-17

BUILDINGS.

9-24	Plumbing, Baltimore, Md.	8-24
9-24	Quarters, Ft. Standish, Mass.	9- 3
9-25	Jail, Sacramento, Cal.	9-17
9-28	*Post-office, Dalton, Ga.	8-20
9-29	*Post-office, Bridgeton, N. J.	8-20
9-29	*Boilers, Poughkeepsie, N. Y.	9-24
9-29	Hospital, Raleigh, N. C.	9-24
9-29	*Stables, etc., West Point, N. Y.	9-17
9-30	Quarters, Jefferson Bks., Me.	9-17
9-30	Post-office, Cape Girardeau, Mo.	8- 6
9-30	Buildings, New Orleans, La.	9-10
10- 1	*Post-office, Charlottesville, Va.	8-20
10- 1	Steel channels, Atlanta, Ga. (Bldgs.)	9-17
10- 1	Plans, Vancouver, B. C.	9-24
10- 2	Court-house, Pueblo, Colo.	9-24
10- 2	Bldg., etc., Vancouver Bks., Wash	9-17
10- 2	*Mail lift, Meriden, Conn. (Bldgs.)	9-17
10- 2	Laundry, etc., Spring City, Pa. (Mfg. Pl.)	9-17
10- 3	Laundry, Norfolk, Va. (Mfg. Pl.)	9-17
10- 5	Schools, New York, N. Y.	9-24
10- 5	Post-office, Chippewa Falls, Wis.	8-27
10- 6	*Vault, Washington, D. C.	9-10
10- 8	Post-office, Hagerstown, Md.	9-17
10- 8	Shops, St. Boniface, Man (Mfg. Pl.)	9-24
10- 9	Quarters, Ft. Howard, Md.	9-17
10-10	Post-office, Butte, Mont.	8-20
10-10	Walls, etc., Paris, Ill.	9-24
10-10	Building, Birmingham, Ala.	9-24
10-15	Post-office, Marietta, Ohio.	9-24
10-15	*Quarters, Ft Andrews, Mass.	9-17
10-17	Court-house, Boston, Mass.	9-10
10-19	*Post-office, Porto Rico	9- 3
10-30	*Post-office, Carthage, Mo.	9-24
11- 1	School, Wilkinburg, Pa.	9-10

WATER-WORKS.

9-25	Machine tools, Cincinnati, O.	9-10
9-25	Water-works, Walcottville, Ind.	9-24
9-26	Water-works, Chicago, Ill.	9-24
9-28	Water-mains, Albert Lea, Minn.	9-17
9-28	Pipe, Decatur, Ill.	9-24
9-28	Water mains, Deer River, Minn.	9-24
9-28	Tower, Bernidji, Minn.	9-24
9-28	*W.-Works, Verona, N. J.	9-24
9-29	*Water-works, Alleghany, N. Y.	9-17
9-30	*W.-Works, Marcellus, N. Y.	9-24
9-30	*Water-works, Winfield, Kan.	9-17
9-30	*Boilers, East Liverpool, Ohio	9-24
9-30	*Water supply, Rochester, N. Y.	9-24
9-30	Pumping plant, New Boston, Ill.	9-10
10- 1	Dam, etc., Albany, N. Y.	9-17
10- 1	*Standpipe roof, Wrentham, Mass.	9-17
10- 2	Reservoir, Astoria, Ore.	9-24
10- 2	Water-works, Kiowa, Kan.	9-24
10- 5	Well, Harrisonburg, La.	8-20
10- 5	Water-main, Grand Forks, N. D.	9-24
10- 6	*Boilers, Engines, Burlington, Ia.	9-10
10- 6	Water-works, Hope, Ark.	9-17
10- 6	*W.-Works, Haddonfield, N. J.	9-17
10- 7	Tower, Otoe, Okla	9-24
10-12	*Filtration plant, Evansville, Ind.	9- 3
10-14	Cast-iron pipe, etc., Vancouver, B. C.	8-13
10-14	Water-pipe, Chagrin Falls, Ohio.	9-17
10-19	*Engine, Houston, Tex.	9-17
10-30	Water pipe, etc., Passaic, N. J.	9-17

SEWERS.

9-24	Drain, Milwaukee, Wis.	9-24
9-24	Sewer, Anniston, Ala.	9-24
9-25	Sewers, Massillon, Ohio	9-24
9-26	Sewers, Seattle, Wash.	9-24
9-28	Sewer, Fort Dodge, Iowa	9-24
9-28	Sewer, Steubenville, Ohio	9-24
9-28	Sewer, Jackson, Ohio	9-10
9-28	Sewer, Washington, D. C.	9-17
9-29	*Sewer, West Point, N. Y.	9-17
9-29	Sewers, Oxford, Ohio	9-17
9-30	*Sewers, Norristown, Pa.	9- 3
9-30	*Disposal plant, Danville, Pa.	9-17
10- 2	Sewers, Dayton, Ohio	9-24
10- 5	Sewers, Lawrence, Kan.	9-24
10- 6	Sewer, Cherokee, Iowa	9-24
10- 6	Sewers, Hope, Ark.	9-17
10- 6	Sewers, Corlett, Ohio	9-17
10- 9	*Sewer, Louisville, Ky.	9-24
10-14	*Disposal plant, Baltimore, Md.	9-17
10-28	*Sewers, etc., Rye, N. Y.	9-24

STREETS AND ROADS.

9-24	Sidewalks, West Seneca, N. Y.	9-24
9-25	Road, Cincinnati, Ohio	9- 3
9-25	Resurfacing, Muncie, Ind.	9-17
9-26	Paving, Chicago, Ill.	9-24
9-28	*Macadam, etc., Ft. Andrews, Mass.	9- 3
9-20	Pavement, Kirksville, Mo.	9-24
9-29	Grading, Hartford, Conn.	9-24
9-29	Paving, Scio, Ohio	9-10
9-29	Gravel roads, Frankfort, Ind.	9- 3
9-29	Paving, Portsmouth, Va.	9-17
9-30	*Grading, York, Pa.	9-17
10- 1	Repaving, New York, N. Y.	9-17
10- 1	Roads, York, Pa.	9-24
10- 1	Sodding, etc., Ft. Wood, N. Y.	9-24
10- 3	*Macadam, Atlanta, Ga.	9-17
10- 5	Road, Liberty, Ind.	9-17
10- 5	Roads, Crown Point, Ind.	9-24
10- 5	Asphalt repair, New York	9-24
10- 5	*Macadam Westfield, N. J.	9-24
10- 6	Roads, Vincennes, Ind.	9-24
10- 6	*Paving, Bayonne, N. J.	9-24
10- 6	Road, Clearfield, Pa.	9-24
10- 7	Road, La Fayette, Ind.	9-24
10- 7	Roads, Muncie, Ind.	9-24
10- 7	Roads, Corydon, Ind.	9-24
10-10	Grading, Carthage, Ohio	9-17

MISCELLANEOUS.

9-26	Ditches, Decatur, Ill.	9-17
9-26	Drains, Champaign, Ill.	9-24
9-28	Dam, Carillon, Que.	9-24
9-28	Trans-Continental Ry., Ottawa, Ont. (Railways)	9-24
9-28	Wharf, Cleveland, Ohio	9-17
9-28	Electric railway, Panama	9-10
9-28	*Elect. industrial ry., Panama	9- 3
9-29	*Light-house, Baltimore, Md.	9- 3
9-29	*Tile drains, Beardstown, Ill.	9-10
9-29	Naval supplies, Indianapolis, Ind.	9-24
9-30	Gates, Brooklyn, N. Y.	9-24
9-30	*Dredging, Norfolk, Va.	9-10
9-30	Air compressor, Ft Washington, Md	9-17
9-30	Wharf, New York	9-17
9-30	*Excavation, Chicago, Ill.	9-17
10- 1	Gasoline engine, Washington, D. C	9-17
10- 1	Sodding, Ft. Wood, N. Y.	9-17
10- 1	Iron chain, New York	9-24
10- 3	Levee, Velasco, Tex.	9-17
10- 5	*Rock excavation, Boston, Mass.	9-10
10- 5	Lumber, rails, Panama	9-17
10- 5	Dredge equipment, New Orleans, La	9-17
10- 5	Levee, Sacramento, Cal.	9-17
10- 5	Sprinkling system, New York	9-24
10- 5	Drain, Rockwell City, Ind.	9-24
10- 7	Wall, Elmira, N. Y.	9-24
10- 7	Cranes, Panama	9-17
10- 8	Ditch, Cerro Gordo, Ill.	9-10
10- 9	*Wharf, seawall, Mobile, Ala.	9-10
10-10	*Steel stack, boilers, Boston, Mass.	9-17
10-10	Track scale, Ft. George Wright, Wash.	9-24
10-12	Derricks, railway supplies, Panama	9-17
10-14	*Removing wreck, Portland, Me.	9-17
10-14	*Dredging excav., Chicago, Ill.	9-17
11- 2	Submarines, Wash., D. C.	8-13
11- 9	Battleships, Washington, D. C.	9-17
10-16	Dredges, Panama	9-24
11-17	*Lock and dam, Mobile, Ala.	9-17
10-19	*Rock-crushing plant, Washington, D. C.	9-24
10-19	Levee work, Memphis, Tenn.	9-24
12- 1	Dredging, Hawaii	9-17

FOREIGN.

9-25	Tramway, Spain	9-10
9-25	Elec. traveling cranes, Germany	9-17
9-26	Bridge, Egypt	9-10
9-30	Ry. tunnels, Germany	9-17
10- 1	Railway material, Siam	7-16
10- 6	Telegraph material, Australia	9-10
10-14	Dredging, Spain	7-16
10-14	Tramway, Roumania	9-10
10-14	Ry. telegraph system, Brazil	9-17
10-15	Drydock, Italy	9-10
10-21	Power plant, Australia	9-10
10-29	Reservoir, pipe, India	8- 6
11- 2	Electric plant, Chile	7-16
11- 2	Telegraph material, Australia	9-10
11- 4	Reservoir, India	8- 6
12- 1	*Sewers, paving, Ecuador	8- 6

CIVIL SERVICE.

9-26	Draftsmen, etc., Albany, N. Y.	9- 10
10- 7	Examiner of Accounts, Washington, D. C.	9-10
10- 7	Hydrographic Draftsman, Washington, D. C.	9-10
10-19	Highway Ry. and Irrig. Engr., Philippines	9-24
10-21	Mech. draftsman, Wash., D. C.	10-24
10-21	Asst. designer, Wash., D. C.	9-24
10-21	Forest Asst., Philippines	9-24

RAILWAYS.

ARIZONA.—The Calumet & Arizona Mining Co. may build a railroad from Benson, Ariz., down the San Pedro valley for about 30 miles. The line would connect with the El Paso & Southwestern system at Benson. Louis W. Powell is Third Vice-Pres. Offices are at Bisbee, Ariz.

CANADIAN PACIFIC.—The company has filed plans for the first 25 miles of the road running out of Regina, Sask., the ultimate destination of which is Prince Albert, Sask. Plans also have been filed for a revision of the location of the line from Bulyea, Sask., to the junction with the Regina-Prince Albert branch, construction on which is to be commenced at once.

It is the intention of the company to construct a line about 1,500 miles long, to the Yukon, and surveying parties have been over the route. From Athabasca Landing, Alta., to Fort St. John, across the British Columbia line, the road will proceed in a northwesterly direction until the Pine River Pass carries the road across the first range of Rockies, and thence by the mountain passes the road will proceed northerly. C. E. Cartwright, Ch. Engr., Vancouver, B. C.

COLORADO & SOUTHERN.—Surveyors for this road are locating a line to enter Pueblo. The work is almost completed and construction will probably be started soon. H. W. Cowan, Denver, Colo., is Ch. Engr.

DES MOINES, COUNCIL BLUFFS & WESTERN.—Articles of incorporation were filed at Pierre, S. Dak., on Sept. 9 for the Des Moines, Council Bluffs & Western Ry. Co., with nominal headquarters at Pierre and a business office at Des Moines. The company is capitalized at $100,000. It will build a road from Council Bluffs to Des Moines, with an eastern extension to Muscatine. The directors of the new line are Robert Pilmery, Norwalk, Iowa; N. W. Hansen, Haslith, Iowa; R. C. Wallace, J. S. Carlock, and R. S. Bannister, of Des Moines, and A. P. Sawyer, of Pierre, who is the state agent for the company.

ENID, OCHILTREE & WESTERN.—A. E. Wiest, Jr., Vice-Pres. and Gen. Mgr., Ochiltree, Tex., states, according to the Manufacturers' Record, that this corporation will be chartered to build a line from Enid, Okla., to Dalhart, Tex., about 265 miles. At present the construction of only 100 miles is contemplated, from Ochiltree to Dalhart, with no grade to exceed one-half of 1%, no bridges and but few culverts. It is proposed to secure subscription along the line for $500,000 in stock, besides right-of-way and terminal sites. Mr. Wiest says subscriptions for over $300,000 have been obtained. All letters relating to construction and equipment should be addressed to him. The Directors are: Pres., George M. Perry; Vice-Pres. and Gen. Mgr., A. E. Wiest, Jr.; Treas., James T. Fryer; W. S. Graves, J. A. Russell, W. M. McMillen and E. L. Whippo, all of Ochiltree, Tex.; W. B. Dennison, of Glazier, Tex., and Milo Blodgett, of Walstad, Tex. Other officers are: Secy., J. B. Cartright; Auditor, H. Palmer; Gen. Supt., W. D. Garwood, all of Ochiltree, Tex.

GEORGIA & FLORIDA.—An extension is to be built from Nashville to Adel, Ga. G. B. Hazelhurst, Douglas, Ga., is Ch. Engr.

GRAHAM, ROSWELL & WESTERN.—Chartered to build a line from Graham, Tex., through Young, Throckmorton, Haskell, Stonewall, Kent, Garza, Lynn, Perry and Yoakum counties, to Roswell, N. Mex., about 350 miles. The incorporators are John E. Morrison, S. R. Crawford, R. E. Mabry, S. B. Street, E. S. Graham, E. G. Vick, C. W. Johnson, Arnold & Arnold, all of Graham, Tex.; A. B. Goodenough, Hereford, Tex., and H. P. Faris of Clinton, Mo.

GULF, COLORADO & SANTA FE.—It is announced that this company within 30 days will begin the construction of a line from Cleburne to Glen Rose, Tex., a distance of 106 miles. W. B. Storey, Jr., is Ch. Engr. A., T. & S. F. system, Chicago; C. A. Morse is Ch. Engr., Topeka.

IDAHO.—The Twin Falls North Side Land & Water Co. has awarded a contract to the CARNEGIE STEEL CO., Carnegie Bldg., Pittsburg, for 26 miles of steel rails for the construction of a railroad in Idaho. The contract price is $70,000. The Twin Falls concern will build a railroad between Gooding and Jerome, Idaho, for the purpose of penetrating the company's irrigation tract in the vicinity of Jerome.

MONROE, FARMERVILLE & NORTHWESTERN.—D. H. Nichols, Vice-Pres. of the Ouachita Construction Co., has announced that W. S. Davis, Ch. Engr., will begin survey for the Monroe, Farmerville & Northwestern Railroad from Monroe, La., via Farmerville, La., to Hope, Ark. The company may build an extension in the opposite direction from Monroe through Franklin Parish.

MONTREAL & SOUTHERN COUNTIES.—The company will commence the construction soon of the first section of the proposed road running from Montreal to St. Lambert, Quebec.

NEW MEXICO CENTRAL.—The Santa Fe Central and the Albuquerque Eastern railroads have been consolidated and will hereafter be operated as one property under the name of the New Mexico Central Railroad. The Santa Fe Central ran from Santa Fe to Torrence, a distance of 116 miles. The former Albuquerque Eastern connected with the Santa Fe Central at Moriarty and was projected to run to the Hagan coal fields. It is stated that the merged company will complete the extension to the coal fields without delay. W. C. Hagan, Arrott Bldg., Pittsburg, Pa., and J. H. Hunter, of Pittsburg, were interested in the Albuquerque Eastern.

NORFOLK & WESTERN.—Contract has been let to the LUCK CONSTRUCTION CO., of Roanoke, Va., for grading seven miles of line from Blacksford to Elk Garden on the Norfolk & Western Short Line, work to begin at once. C. S. Churchill, Roanoke, Va., is Ch. Engr.

PACIFIC & IDAHO NORTHERN.—An extension will be built next year from Evergreen to Roseberry, Idaho, a distance of 45 miles. The P. & I. N. Ry. now extends from Weiser to Evergreen, Idaho, 76 miles. R. E. Merrick is Ch. Engr., Weiser.

PEMBERTON MEADOWS & NORTHERN.—Company has filed plans for its proposed route from Pemberton, B. C., northward. It is negotiating for right-of-way.

SONOMA & LAKE COUNTY.—Survey is being made between Cloverdale and Lakeport, Cal., about 27 miles. There will be one tunnel. J. E. Fulton and D. F. McIntire, of Lakeport, are the promoters of this railroad.

SOUTHERN UTAH R. R.—The Secretary of the Interior, Washington, D. C., has approved of plans of the right-of-way for this company. The proposed railroad is to be 18 miles long, will start at Price, Utah, and follow the water grade of Miller Creek into the coal fields of Carbon County, the purpose of the construction of the road being the development of the coal fields. J. H. R. Franklin, 268 South Main St., Salt Lake City, Utah, Pres.; J. R. Schreck, Salt Lake City, Secy.

TRANS-CONTINENTAL.—Bids are asked until noon, Sept. 28, by the Commissioners of the Trans-Continental Ry. at Ottawa, Ont., for the work required for the construction, in accordance with the plans, profiles and specifications of the Commissioners, of the following sections of the Trans-Continental Railway:

(1) Districts "D" and "E."—From a point at the western end of Fauquier Bros.' Abitibi contract, in the province of Ontario, in a westerly direction for a distance of about 104.24 miles. Date of completion, Dec. 31, 1910.

(2) District E—From a point about 60 miles west of the easterly boundary of District "E," in the Province of Ontario, westerly to the end of Fauquier Bros'. contract, north of Lake Nepigon, a distance of about 100 miles. Date of completion, Dec. 31, 1910.

Plans, profiles and specifications may be seen in the office of H. D. Lumsden, Ch. Engr., Ottawa; also in the office of John Aylen, Acting District Engr., North Bay, Ont., and T. S. Armstrong, Nepigon, Ont. Noted on July 30.

WAYNESBORO, PASCAGOULA & GULF.—We are officially advised that surveys have been completed for this proposed line. It will run from Waynesboro to Scranton, Miss., via Lucedale and Moss Point, 107 miles. Construction probably will not begin until next year. J. R. S. Pitts is Pres., Waynesboro, Miss.

WEST VIRGINIA CONNECTING R. R.—Right-of-way is being secured along the line of the proposed railroad, which has been surveyed between Belington, W. Va., and a point near Carnegie, Pa. A charter for the new company was issued about two years ago and among the incorporators are D. F. Maroney, of Pittsburg, Vice-Pres. of the Pittsburg, Shawmut & Northern R. R. Co.; J. V. Thompson, of Uniontown, and others. The original charter called for a road from Belington to Waynesburg, Pa., 68 miles. Surveys have been completed toward Pittsburg as far as Carnegie. It is understood that the line will have direct connection with other roads at Carnegie, giving the West Virginia Connecting an entrance to Pittsburg proper. Agents are renewing options for right-of-way, which will expire this fall.

WESTERN PACIFIC.—The directors of the company have authorized the sale of $25,000,000 second mortgage bonds to complete the main line betwen San Francisco and Salt Lake City. V. G. Bogue, San Francisco, Cal., Ch. Engr.

ELECTRIC RAILWAYS.

TORRINGTON, CONN.—The Litchfield & Torrington Tramway Co. will start construction of its proposed electric railway which is to connect Torrington and Litchfield, a distance of six miles. The surveys have been finished, and the right-of-way secured between the towns. John E. Sewell, of Waterbury, Conn., is in charge of the preliminary work.

NEW YORK, N. Y.—Nichols & Walsh, Attys., 128 Broadway, advise us that it is intended to build an electric railway to run from Chambers and William Sts., through William St. to Maiden Lane, to Broadway, across Broadway to Cortlandt St. to West St., to Fulton St., and thence to the Fulton Street ferry, touching at the Terminal Bldgs. A charter has been granted to the Greater New York Traction Co. to build this line. The directors are: C. F. Thumm, 60 Wall St.; Arthur G. Still, 541 West 158th St.; Joseph W. Spencer, 15 William St.; Frank S. Burns, Charles M. Koop, John A. Gallagher, 160 Broadway; A. C. Austin, Jr., and E. M. Fuller, 1 Madison Ave, and R. W. Alexander, 42 West 64th St., New York City. The company has a capital of $15,000, divided into $100 shares.

NEW YORK, N. Y.—Judge Lacombe has granted the petition of Frederick W. Whitridge, Receiver of the Third Avenue and Union Railroad companies for permission to apply for franchises for proposed extensions of both roads. Following are the extensions proposed for the Third Avenue lines: 1. Blackwell's Island Bridge to connect with the tracks of Third Ave. lines on Third Ave., along 58th and 60th Sts., and then along and over the bridge upon tracks to be installed by the city to its easterly terminus, at the northerly end of Long Island City.

2. Manhattan Bridge extension over bridge by connecting the Third Ave. tracks at the junction of Bowery and Canal Sts. to its terminus at Jay and Bridge Sts. in Brooklyn.

3. Amsterdam Avenue loop, to extend the present tracks of the Third ave. company on Amsterdam Ave. along Fort George Ave. to St. Nicholas Ave. to 190th St. and easterly on 190th St. to Amsterdam Ave.

These extensions are proposed for the Union Railway Co.: 1. Classon Point Road, proposed route from Westchester Ave. in The Bronx along Classon Point Road to Classon Point.

2. Pelham Ave. extension, extending present Fordham line from its terminus at Fordham along Pelham Ave. to the Southern Boulevard to the entrance of Bronx Park.

3. 207th St. bridge, running from the double track line of the Union Railway Co. on Fordham Landing Road westerly on 207th St. to Broadway, connecting with the Rapid Transit station at 207th St. and Eleventh Ave. and with the Kingsbridge Co.'s lines on Broadway.

4. 230th St. extension, extending the tracks of the Union Railway Co. on 230th St. from Bailey Ave. to Broadway, a distance of about 800 ft.

NEW YORK, N. Y.—George H. Pegram, Ch. Engr., Rapid Transit Subway Construction Co., Park Row Bldg., writes us regarding proposed improvement of the subway at 96th St., Broadway Line: "We contemplate the building of two additional tracks on each side of the present subway, from 96th to 101st Sts., in order to avoid grade crossings at this point. The work is being done by this company and other contracts will not be let except for steel work. The estimated cost is $1,000,000.

NEW CASTLE, PA.—C. J. D. Strhecker, Main St., Zelienople, Ohio, is reported to be promoting an electric railway which will connect Wampum and New Castle, Pa. It will run through West Pittsburg and South New Castle Borough.

ROANOKE, VA.—The Roanoke Railway & Electric Co. will start work extending its lines in the southwestern part of the city on Oct. 1. J. W. Hancock is Gen. Mgr.

LAKE CHARLES, LA.—We are officially advised the Lake Charles Railway & Light Co. will build an extension out Eleventh St. to Kirkman, to Hi Mount addition, 1½ miles long. Surveys have been partly made and right-of-way has been obtained. Contracts probably will be let in the spring. Thompson J. Bird, Lake Charles, is Pres. This company will take over the property of the Lake Charles St. Ry. Co.

KNOXVILLE, TENN.—The Knoxville Railway & Light Co. has just been granted a franchise to double-track its line on Central St. from the junction of Broadway to the corporation line. C. H. Harvey, Knoxville, is Gen. Mgr.

VALPARAISO, IND.—The Valparaiso & Northern Ry. Co. has been incorporated to construct and operate street and interurban railroads in Porter County. Capital stock, $10,000. The first line will be constructed from Valparaiso to Chesterton. A system will also be built in Chesterton. Headquarters, Valparaiso. Directors: George G. Pfleger, L. E. Woodard, D. R. Chase, M. J. Cook and W. R. Watson, all of Chicago.

SPRINGFIELD, ILL.—The Saline County Traction Co. has been incorporated in Illinois to construct an electric railway from Eldorado through Harrisburg to Carriers Mills. The line will cover a distance of 17 miles. Principal office, Danville, Ill. Capital stock, $5,000. Incorporators: L. E. Fischer, Danville; J. A. Swanberg, Springfield; W. L. Murphy, Danville; L. W. Johnson, Danville, and A. C. Murray, Springfield.

CHICAGO, ILL.—J. T. Harahan, Pres. of the Illinois Central R. R., has announced that at a meeting of the Board of Directors of the road held on Sept. 16, authority was granted for a full investigation of the question of electrifying the Illinois Central terminals at Chicago. A. S. Baldwin is Ch. Engr., Chicago.

IOWA CITY, IOWA.—A franchise has been granted by the City Council to Henry Negus and A. J. Hamiel, in behalf of the Rundell Land & Improvement Co. for a street railway in Iowa City. The length of the system will be five miles.

LOUISIANA, MO.—We are officially informed that the plan of the Louisiana Light, Power & Traction Co. to build an electric line between Louisiana and Bowling Green, Pike County, eleven miles, has been deferred indefinitely. Capital stock, $200,000. Power-house and repair shop will be located at Louisiana. L. Turnbolt is Pres. and Gen. Mgr., and F. E. Murray, Secy., at Louisiana. Previously noted.

KANSAS CITY, MO.—The Interstate Railway & Power Co., Kansas City, has been organized to build and operate a network of electric lines covering eastern and southern Kansas with a main interurban line between Kansas City and Topeka by the way of Lawrence. Union Trust Co. has been organized and is to finance the deal. Headquarters of both companies are to be in Kansas City. Among those interested are: William Kenefick, Bryant Bldg.; W. A. Rule, William G. Holt, R. C. Rawlings and C. A. Braley, all of Kansas City.

KANSAS CITY, MO.—Geo. P. Norton, Gen. Atty., 1001 New York Life Bldg., Kansas City, informs us that the Kansas City Southeastern Traction Co. has its own construction company, which will sublet the construction work, if satisfactory bids are received. Date is not set for letting contracts, but work must begin by Feb. 1. Capital is obtained. Surveys are partly made and right-of-way is secured as far as line has been surveyed. The railway will run from Kansas City, Mo., in a southeasterly direction, passing through the towns of Leeds, Raytown, Little Blue, Lee's Summit, Cockrell and Lone Jack, tapping one of the best farming districts in the State, as previously noted. The motive power will be electricity. One section will be about 30 miles long and another additional total of 155 miles. Charles A. S. Sims is Pres., 3724 East 27th St.; Howard W. Gibson is Vice-Pres., 2702 Mersington Ave.; B. F. Shouse, Treas., 3724 East 27th St.; C. G. Minturn, Secy., 2714 Mersington Ave.; W. N. Collins, Auditor, 2514 Benton Boulevard; George P. Norton, Gen. Attorney; J. C. Herring, Ch. Engr., 2201 Jackson Ave.; C. W. McDaniel, Purchasing Agent, Sixth and Wyandotte Sts., all at Kansas City, Mo.

PINE BLUFF, ARK.—We are officially advised that the Central Arkansas Elec. Ry. Co. will build an electric line from Pine Bluff to Little Rock and from Junction City to Hot Springs, 90 miles in length. Preliminary surveys are made. Right-of-way is partly obtained. Capital has not been secured. Date for letting contracts is indefinite. J. A. Holmes is Pres. and A. M. Van Auken is Ch. Engr., both at Pine Bluff.

GRAND JUNCTION, COLO.—We are advised by E. A. Sunderlin, Gen. Mgr., that surveys have been completed, and franchises and right-of-way secured for the proposed Grand Junction, Palisade & Plateau Valley Ry., which is to connect Grand Junction and Palisade, Colo., a distance of 17 miles.

SEATTLE, WASH.—Stone & Webster, 147 Milk St., Boston, Mass., have purchased the Seattle-Everett Interurban Ry., a new electric line projected by Fred E. Sander and associates of this city, part of which has been completed. It will be consolidated with the Seattle Electric Co., which operates the street electric car lines and the Puget Sound Electric Ry. lines, the interurban to Tacoma. The line will be extended from Everett to Bellingham, where it will form the north end of a proposed through electric line from Portland to the Canadian border in connection with the Puget Sound Electric Ry., W. S. Dimmock, Mgr., Tacoma, Wash.

GRANT'S PASS, ORE.—We are officially advised that the Rogue River & Oregon Southern Ry. Co. will construct an electric railway from Grant's Pass to Kirby, Ore., 30 miles. Surveys are partly made and right-of-way partly secured. Capital has been obtained. Date for letting contracts is indefinite. G. A. Collins is Pres. and Ch. Engr., Grant's Pass, Ore. Noted on Aug. 20.

BRANTFORD, ONT.—The Brantford & Hamilton Electric Ry. Co., of Hamilton, Ont., will complete its entrance into Brantford across the canal from Alfred St. to the South Market St. bridge. The work will require, it is estimated, an expenditure of about $30,000. Trestle work will have to be built a distance of about one-quarter of a mile, and the rails laid on this. William C. Hawkins is Gen. Mgr.

LIGHT AND POWER PLANTS.

(* *denotes that this work is advertised in Engineering News.*)

BRATTLEBORO, VT.—The Twin State Gas & Electric Co., of Brattleboro, has awarded contract to J. C. PELLETT & SONS for reconstructing the foundations of the engines and building of the steam power station. The company is said to be reconstructing the intake at its water power station, eight miles north of the city at Dummertown, Vt.

DANIELSON, CONN.—The Nashawaug Electric Power Co. is to erect a power plant at Daniel's Village (Killingly) at a cost of $55,000. This is to develop 300 HP. The building is to be of stone and concrete, and the equipment will consist of a pair of 27-in. horizontal water wheels and will be connected with a 3-phase, 60-cycle, alternating current, 2,300-volt generator. It will require 340 ft. of steel tube, eight feet in diameter, to conduct the water.

CANANDAIGUA, N. Y.—Bids are asked until Sept. 26 by J. Foster Warner, Arch., 1036 Granite Bldg., Rochester, care of R. M. Simmons, Chmn. Special Bldg. Com., for the electric wiring, for lighting and power, also fixtures, etc., for the court-house at Canandaigua.

BUFFALO, N. Y.—The Cataract Power & Conduit Co., of Buffalo, is reported to have petitioned the Public Service Comn., at Albany, for authority to issue $120,000 bonds, to be used for the acquisition of property and for the construction, extension and improvement of its plant. Charles R. Huntley, Buffalo, N. Y., is Gen. Mgr.

WEST SENECA (Buffalo post-office), N. Y.—The Buffalo General Electric Co., C. R. Huntley, Gen. Mgr., P. F. Sellers, Electrical Engr., 702 Fidelity Bldg., Buffalo, N. Y., will erect a sub-station in the town of West Seneca, N. Y., for the purpose of transforming energy from Niagara Falls to be used for street lighting. One hundred and fifty magnetite lamps are to replace the 6.6 amp series direct-current lamps formerly used for lighting the villages of West Seneca and Blasdell. Installation will be made by company's construction department and will consist of three 125-KW. oil-cooled transformers, three 50-light magnetite lamp circuits, mercury arc system, switchboard and other accessories. Electricity will be delivered to the transformer station at a tension of 12,000 volts and will be stepped down to 2,200 volts.

NEWBURGH, N. Y.—The Newburgh Light, Heat & Power Co. has made application to the Public Service Commission for permission to issue convertible debenture bonds to the amount of $350,000. Of this amount it is proposed to use $25,000 for placing a number of its transmission lines and conduits under ground; $18,000 for extending the transmission lines to Ashokin for supplying electricity in that section; $39,930 for additional equipment and improvements to the power plant at Newburgh; $100,000 for erecting new transmission lines, and the balance in purchasing the properties of the Hudson Counties Gas & Electric Co. and the supply of electric energy generated at Honks Falls. William R. Beal is Gen. Mgr.

BALTIMORE, MD.—Robert J. McCuen, Supt. of Lamps and Lighting is preparing estimates of the probable cost of the erection of a public lighting plant in Baltimore to be built in connection with the power-house for the pipe-line system.

WASHINGTON, D. C.—Bids are asked by H. L. Pettus, Constr. Q. M., Takoma Substation, Washington, D. C., until Oct. 17 for furnishing and installing combination gas and electric fixtures at the Walter Reed Army General Hospital.

PULASKI, VA.—We are advised by John T. Loving that the Council is estimating on the proposed municipal electric lighting plant. J. W. Miller is Chn. Finance Com.; Edgar C. Wiley, Law Bldg., Lynchburg, Va., is Consult. Engr. Noted on Aug. 6.

BRISTOL, VA.—The Bristol Gas & Electric Co. has awarded contract, aggregating $50,000, to WESTINGHOUSE ELECTRIC & MFG. CO., of Pittsburg, Pa., for additional electrical machinery, including two generators or dynamos, each having capacity of 300 kilowatts; condensor for utilizing escaped steam and turbine engine of vertical pattern to operate dynamos. S. M. Vance is Supt., Bristol.

MONTGOMERY, ALA.—The Montgomery Light & Water Power Co. has announced that it will spend $100,000 on improvements. The most of this amount will be expended upon the power plant which is situated at Tallasee Falls, about 30 miles from this city. It is estimated that these improvements will develop a 10,000-HP. capacity. R. J. Chambers, Montgomery, is Mgr.

GANTTS QUARRY, ALA.—The Alabama White Marble Co. will install additional machinery at its plant, including a 300-HP. engine, two 300-HP. boilers, dynamo, five rubbing beds, ten gang saws, air compressor driving 1,800 ft. a minute, 20-HP. engine at McClurg's Spring to pump water 3,000 ft. through 6-in. pipe to quarry. John Stephen Sewell is in charge. The improvements will cost about $150,000.

LUCEDALE, MISS.—The Lucedale Light & Power Co. has awarded contract to the ALLIS-CHALMERS CO., Milwaukee, Wis., for electrical installation, and to J. A. HOLIFELD, Mobile, Ala., for installation of poles, lights, etc., for mill and town. Work is to be completed by Oct. 15. Capacity of plant, 1,000 incandescent lamps.

LIMA, OHIO.—It is stated that the Board of Public Service has selected J. Walter Esterline, of La Fayette, Ind., to prepare plans and specifications for the proposed municipal electric light plant. Estimated cost, $70,000.

NEW BREMEN, OHIO.—The Contract for furnishing material and erecting the machinery and equipment for a complete A. C., 2-phase, 60-cycle, 2,300-volt system, has been awarded to the WESTERN ELECTRIC CO., of North High St., Columbus, Ohio. Franklin Engineering Co., Engrs., 44 Douglas Bldg., Columbus; F. W. Schroeder, Jr., is Village Clerk.

WARREN, OHIO.—The Hydro-Electric Co., which will establish a big power plant, has let a contract to WALDECK & REEDY here for the excavation work to be done for the proposed dam across the river. The present dam at Leavittsburg across the Mahoning River is to be torn out and will be replaced with a concrete dam which will be located at the mouth of Duck Creek.

ST. CLAIRSVILLE, OHIO.—The power plant at the Provident mine of the Provident Coal Co., on Jug Run, near here, has been destroyed by fire, caused by defective electric wiring. The loss is $5,000. Five hundred men will be idle as a result. The plant will be rebuilt at once.

COAL CITY, IND.—Warren Meek is at the head of a company which proposes to construct a 50-ft. dam on Eel River and to build and equip a power plant to generate electricity.

CUMBERLAND, WIS.—We are officially advised that on Sept. 14 J. G. ROBERTSON, Gilfillan Block, St. Paul, was awarded contract by A. E. Wright, City Clerk, for improvements and additions to the water-works and electric light plant. Oscar Claussen, German-American Bank Bldg., St. Paul, Minn., Engr.

PORT WASHINGTON, WIS.—Contracts for constructing power plant for the water-works and electric light plant have been awarded as follows: To NORDBERG MFG. CO., Chicago St. and Oklahoma Ave., Milwaukee, for engines and condensers, $10,170; to FORT WAYNE ELECTRIC CO., Fort Wayne, Ind., for electrical machinery, $3,662, and to J. UBBINK, of Port Washington, for chimney, 90 ft. high by 3 ft. 10 ins. x 3 ft. 10 ins., $1,560, and same contractor for power-house extension, 42 × [illegible] ft., $4,269. The contract for boilers has not been awarded. W. T. Kirchoffer, Madison, is Engr.

KIOWA, KAN.—See item under Water-Supply—Irrigation.

TOWNSEND, MONT.—The municipal electric light plant will be increased by either a 60, 70 or 75-KW., single-phase, 60-cycle, alternating-current generator, with pulley and exciter. Estimates will be received until Oct. 1. H. M. Ogden is Mgr. City Electric Dept.

CORPUS CHRISTI, TEX.—The People's Light Co., recently incorporated, will build and operate a plant to supply light and power to the city and vicinity. Gas and electric machinery will be installed. Cost, $25,000. George A. von Blucher is Pres., Clark Pease, Vice-Pres. and Treas.; G. Heye, Jr., Secy.; Thomas E. Craig, Supt. and Gen. Mgr.

ANADARKO, OKLA.—We are advised by J. E. Farmington, Chn. Purchasing Com., that the city of Anadarko is ready to receive bids on bonds to the amount of $100,000 to dam the Washita River and install water power, extend light, water and sewer systems and build a city hall. Successful bidder will be permitted to outline the method of procedure for calling election and voting bonds. J. C. Stelzner, Mayor.

YARMOUTH, N. S.—The Yarmouth St. Ry. Co. will build an addition, 40 × 16 ft., to its power station. B. G. Burrill is Pres.

NIAGARA FALLS, ONT.—The Ontario Power Co. is preparing to add two units to the six units in its power-house. The contract for the extension to the power-house has been let to H. D. SYMMES. The building is to be completed by Dec. 1, but the electrical apparatus will not be fully installed until eight months later. The two units will bring the total productive capacity of the plant up to 85,000 HP. The increase is made necessary under the contracts with the Hydro-Electric Power Commission. Work on the new buildings begins at once. W. N. Ryerson, Niagara Falls, Ont., is Supt.

VANCOUVER, B. C.—The British Columbia Electric Ry. Co. has let a contract to JOHN McDOUGALL CO., Montreal, for the supply of a turbine at its power plant at Lake Buntzen, which, with other improvements to be made by the company will cost $300,000. R. H. Sperling is gen. Mgr.

DAWSON, YUKON TER.—The Yukon Basin Gold Dredging Co. plans to harness the Fraser Falls on the Yukon River. William Ogilvie is Pres., Ottawa, Ont.

BRIDGES.

(* *denotes that this work is advertised in Engineering News.*)

BOSTON, MASS.—WILLIAM L. MILLER, 19 Milk St., Boston, has been awarded the contract for rebuilding the Congress St. bridge, bids opened Sept. 14, at the following prices: 715 lin. ft. fence, $1; 730 sq. yds. asphalt sidewalk, $2.50; 6,800 gallons pitch, 14 cts.; 1,720 sq. yds. pebble joints, 10 cts.; 1,720 sq. yds. granite paving, $2.80; 1,800 lbs. anchor rods, 5 cts.; 70 lin. ft. removing fender (lump sum), $50; roadway gates and shelters, $400; 1,000 gallons Cabot's Conservo, 35 cts.; four new oak piles, each, $20; ten main piles, spliced, each, $7; ten old spur-shores, refitted, each, $3; 16 M. ft. replacing old hard pine timber, per M., $16; 110 M. ft. hard pine plank, per M., $43, and 44 M. ft. new hard pine timber, per M., $43. Total, $16,252. Other bidders were: Lawler Bros., $18,097; Jones & Meehan, $18,183; George T. Rendle, $20,131; W. H. Ellis, $20,441.

MONTVILLE, CONN.—The LEY CONSTRUCTION CO., of Springfield, Mass., was awarded the contract on Sept. 8 by the Selectmen for the construction of a bridge across the Oxoboro River.

JERSEY CITY, N. J.—We are officially advised that bids were received as follows on Sept. 17 by the Board of Chosen Freeholders of Hudson County for constructing a highway bridge over the Hackensack River from Newark Ave., Jersey City, to the Newark Turnpike road, Kearney Township: F. R. Long Co., $337,000; Arthur McMullen, $319,750; A. E. Sanford Co., $344,950; Snare & Triest Co., $398,000; Penn. Steel Co., $342,949; F. M. Stillman Co., $313,000. The bridge consists of the following spans: Three fixed spans, 180-ft. center to center end bearings, and one draw span, 248-ft. center to center of end wedge seats, and 225-ft. diameter of swing; piers and abutments of concrete on piles. Contract includes the construction and operation of a temporary bridge during entire time of reconstruction and the removal of present structure. The several widths of each span are as follows: Total width between railings, 50 ft.; trusses, center to center, 35 ft.; roadway, curb to curb, 32 ft.; clear height over roadway, 17 ft.; two sidewalks, each 9 ft. Alex S. Hamill, C. E., 426 Montgomery St., Jersey City, is Engr.

POTTSTOWN, PA.—The Montgomery County Commissioners on Sept. 12 awarded the contract for a bridge over the Manatawny Creek here to the McCLINTIC-MARSHALL CO., Park Bldg., Pittsburg, Pa. for the superstructure, at $16,422, and to JAMES SMITH, of Greenlane, for the substructure, at $13,200.

EAST SMETHPORT, PA.—Elisha Kent Kane has let to the TUNA MFG. CO., of Bradford, Pa., the contract for pier and abutments for the Smethport R. R. Co.'s new steel bridge over Potato Creek here.

HOKENDAUQUA, PA.—R. J. STEWART & BRO. of Easton, Pa., the lowest bidders on the new bridge to be constructed across the Lehigh Valley R. R. at Hokendauqua, were awarded the contract on Sept. 11 by the County Commissioners at $7,900. The bridge is to be 80 × 30 ft. and will be of reinforced concrete, with all the steel encased in concrete. It will be large enough to allow the Lehigh Valley R. R. Co. to build four tracks beneath it.

LILLINGTON, N. C.—The Harnett County Commissioners contemplate constructing steel bridges across Cape Fear River at Lillington and Duke, N. C., destroyed by the recent flood. Estimated cost, $35,000.

GAFFNEY, S. C.—Bids are asked by Cherokee County until Oct. 5 for the erection of a steel or wooden bridge across Buffalo Creek. E. F. Lipscomb is County Superv.

WALHALLA, S. C.—Oconee County will rebuild the Verner bridge, over Conneross Creek. D. F. McAlister is County Superv.

PACOLET, S. C.—A. D. McCLAIN, Spartanburg, S. C., has secured the contract for rebuilding the steel bridge across the Pacolet River here.

ELBERTON, GA.—The County Commissioners have awarded the contract to the ROANOKE BRIDGE CO., Roanoke, Va., for construction of steel bridges to replace structures recently destroyed by flood.

MERIDIAN, MISS.—Bids are asked by J. R. McElroy, City Clk., until Sept. 25 for the construction of a concrete bridge on Eighth St., between 33d and 35th Aves., requiring about 589 cu. yds. concrete, 131 sq. yds. creosoted wood-block paving. Plans, etc., may be obtained from W. G. Wetmore, City Engr.

MEMPHIS, TENN.—The city has awarded the contract to J. A. OMBERG, JR., Memphis, for constructing a concrete bridge across Bayou Gayoso on North Second St. Cost, $8,900; filling and paving work, $4,500 additional.

LOUISVILLE, KY.—Joseph P. Claybrook, City Engr., and David Lyman, Asst. Engr., have completed plans and specifications for the construction of the Oak St. subway between Eighth and Tenth Sts., under tracks of Louisville & Nashville R. R. Estimated cost, $110,000. Bids will probably soon be asked.

TOLEDO, OHIO.—Bids are asked until 10 a. m., Oct. 5, by the County Auditor, for constructing abutments for three bridges.

MADISONVILLE, OHIO.—Bids will be received until Oct. 9 by the County Commissioners, Cincinnati, Fred Dreihs, Clk., for constructing a bridge over Little Duck Creek on Settle St., Madisonville, Columbia Township.

MORRISTOWN, IND.—T. L. Sleeth, Township Trustee, has ordered plans and will soon ask for bids for the construction of a bridge on the line between Rush and Shelby Counties.

VINCENNES, IND.—The construction of a bridge over White River, near Edwardsport, is contemplated by the County Council. Estimated cost, $16,000.

GREEN BAY, WIS.—The citizens on Sept. 1 voted to issue $150,000 bonds for constructing a bridge a cross Fox River at Walnut St. W. H. Reed is City Engr.

NORTH CHICAGO, ILL.—Bids were received as follows on Sept. 17, at the office of the Bureau of Navigation, Navy Department, Washington, D. C., for the construction of a trestle at the Naval Training Station, North Chicago: South Halstead St. Iron Works, 2611 South Halstead St., Chicago, (1) $11,267; (2) $1,424; (3) $12.50 per yd.; Penn Bridge Co., Bond Bldg., Washington, (1) $8,670; (3) $8.50 per yd.

URBANA, ILL.—Bids are asked until 2 p. m., Oct. 3, by the city for the construction of the steel superstructure only of an 80 × 14 ft. highway bridge. Plans and specifications may be obtained from Ira O. Baker, Champaign, Ill.

MANHATTAN, KAN.—Bids are asked until noon, Oct. 9, by George H. Hungerford, County Clk., for the construction of three steel bridges in various townships.

CHICKASHA, OKLA.—Bids are asked by the County Commissioners of Grady County until noon, Oct. 5, for the furnishing and constructing complete, ready for travel, 20 bridges for Grady County, involving approximately 1,327 lin. ft. of bridging and substructure for same and 718 lin. ft. of pile approach. Plans and specifications are on file in the office of J. D. Lindsay, County Clk., and can be had together with any information pertaining to same by applying to the County Clerk or to E. E. Colby, Supt. of Construction, Chickasha.

PAWHUSKA, OKLA.—Bids are asked until Oct. 3 by W. M. Sloan, County Clk., Pawhuska, for constructing seven highway bridges. Bids will be received on either steel and wood, stone arch masonry and reinforced concrete; also stone masonry piers and abutment walls for steel bridges.

GRANTS PASS, ORE.—THE COLUMBIA BRIDGE CO., of Walla Walla, Wash., has been awarded the contract at $27,984 for constructing a steel bridge over the Rogue River here.

LETHBRIDGE, ALTA.—THOMAS KELLY & SONS, Winnipeg, Man., have been awarded the contract for the construction of the Grand Trunk Pacific Ry. bridge across the Old Man River near here at $300,000.

BUILDINGS.

(* *denotes that this work is advertised in Engineering News.*)

PORTSMOUTH, N. H.—The contract for constructing prison cells, plumbing, etc., at the naval station, Portsmouth, N. H., has been awarded to A. P. KNAPP, of Lowell, Mass., at $48,352. A complete list of bids was given on Sept. 10.

NEWPORT, R. I.—We are officially advised that SWALLOW & HOWES, 500 Fifth Ave., New York, have secured the contract for erecting the Cornelius Vanderbilt Memorial Y. M. C. A. building for Alfred G. Vanderbilt, at Newport, R. I. Cost, $115,000. Ewing & Chappell, 345 Fifth Ave., New York, are Archs.

BRISTOL, CONN.—The GRANITE CONSTRUCTION & REALTY CO., of Montpelier, Vt., has been awarded the contract for constructing the proposed church for the St. Anne's Roman Catholic Society.

BATAVIA, N. Y.—HIRAM H. EDGERTON, of Rochester, N. Y., has been awarded the contract for the construction of the Masonic Temple in Batavia. The building is to cost about $40,000, and is to be occupied by June 1, 1909.

NEW YORK, N. Y.—We are officially advised that MARC EIDLITZ & SON, 489 Fifth Ave., New York, have been awarded contract to construct the main hospital building and isolation annex of the Rockefeller Institute for Medical Research, on East 65th St., east of Ave. A, and extending to the East River. The main building will have seven stories, with a brick and Indiana limestone front. The isolation wards will be in a 2-story building connected with the main building by steel bridges. It is estimated the cost of the hospital buildings will be $350,000, the isolation annex $50,000 and the power-house $5,000. York & Sawyer, 156 Fifth Ave., are Archs.

The Meehan Construction Co., 921 Tiffany St., has filed plans for nine 4-story flats, each 38-ft. front, to be erected on the east side of Kelly St., 50 ft. south of Dongan St., at an estimated cost of $225,000.

Allen & Collens, 1170 Broadway, Archs., for the Trustees of the Union Theological Seminary, have filed plans for the chapel of the proposed new seminary buildings, which are to occupy the quadrangle in Claremont Ave., from 120th to 122d Sts., the chapel fronting on the avenue. The building is to be of Gothic type, 182 ft. long and 44 ft. wide, the peaked roof rising 106 ft. above the curb level, and the building being finished with a tower facing 120th St., rising eight stories to a height of 135 ft. The basement will contain a cloister 106 ft. long, floored with brick. The building is to cost $225,000. A library building with dormitories, will cost an additional $700,000. Plans for the library and dormitories were filed several weeks ago by the same architects.

A 6-story apartment house is to be built for the Wille Construction Co., Valentine Wille, Pres., at the corner of St. Nicholas Ave. and 180th St. It will be of brick and ornamental stone, of the Renaissance type, having an avenue frontage of 100 ft. and a depth of 90 ft., and containing 32 suites of apartments. It is to cost $125,000. Neville & Bagge, 217 West 125th St., are Archs.

NEW YORK, N. Y.—We are officially advised that bids were received by Nicholas J. Hayes, Fire Comr., on Sept. 14, for furnishing all the labor and materials required for the erection and completion of a building for Engine Company 64, on the easterly side of Ave. C, 60 ft. south of Ellis Ave., the Bronx. The contract has been awarded to WILLIAM H. WRIGHT & SON, Valentine Ave. and 192d St.

The bids received on Sept. 17 by John F. Ahearn, Pres. Boro. of Manhattan, for repairs and alterations to, and the material and labor required for alterations in rooms on sixth and seventh floors; also for extension to the electric lighting equipment; for carpentry and cabinet work, hardware, metallic and other furniture, painting, electric lighting fixtures, marble and bronze work, plastering, fireproofing and other work in the Hall of Records Building, New York, were as follows: George W. Cobb, Jr., 101 Beekman St., New York, $105,386; Remington & Sherman Co., 359 Broadway, New York, $129,000; Van Doren Iron Works Co., 2685 East 79th St., Cleveland, $141,977; Andrew Grey, Peter Grey & William Grey, New York, $118,700.

The Union Dime Savings Institution, Broadway and 32d St., has had plans prepared by Alfred H. Taylor, Arch., 6 East 42d St., for a banking building to be built at Sixth Ave. and 40th St. Estimated cost, $400,000.

Plans have been filed with the Building Superintendent for a 6-story apartment house, to be built for the Dacorn Realty Co., German Pl. and 156th St., John L. Davis, Pres., at the corner of Claremont Ave. and 122d st., a site opposite the proposed group of buildings of the Union Theological Seminary. It will be of brick, with limestone trimmings, in the design of the French Renaissance, with kepstone arch windows, having small panes. It will have a frontage of 100 ft. on the avenue and 90 ft. in the street, and will contain 36 suites of apartments. It is to cost $175,000. Moore & Landsiedel, 2810 Third Ave., are Archs.

NEW YORK, N. Y.—Bids are asked until 11 a. m., Oct. 5, by C. B. J. Snyder, Supt. School Bldgs., Dept. of Education, for gymnasium apparatus, etc., for Public Schools 24, 64, 75, 80, 156, 158, 159, Boro. of Brooklyn; for moving temporary buildings from rear of Public School No. 84, Glenmore and Stone Aves. and Watkins St., to the corner of Church Ave. and East 48th St., Boro. of Brooklyn; for fitting up cooking room, workshop and science room at Public School No. 155, on Herkimer St. and Eastern Parkway, Boro. of Brooklyn; for installing heating and ventilating apparatus in new Public School No. 157, on Taaffe Pl. and Kent Ave., about 247 ft. south of Park Ave., Boro. of Brooklyn; for alteration, etc., at the Brooklyn Training School for Teachers, Park Pl. and Nostrand Ave., Brooklyn; for new concrete pavement, new iron railings and gates, relaying defective pavements, etc., at Public School No. 35, 163d St, Grant and Morris Aves., Boro. of The Bronx; for installing heating and ventilating apparatus for additions to and alterations in Public School No. 132, on the east side of Wadsworth Ave., between West 182d and 183d Sts., Boro. of Manhattan.

Bids are asked until 10 a. m., Oct. 5, by Theodore A. Bingham, Police Comr., to build and complete the new station-house, prison and stable for the Second Precinct, on the ground and premises in the City of New York, on the west side of Greenwich St. south of Cortlandt St., known as 156 and 158 Greenwich St., running through to and including 163 and 165 Washington St.

SCHENECTADY, N. Y.—The Committee of the College Trustees of Union College at their last meeting decided to locate the proposed General or Civil Engineering Building on the plot of ground between the Kappa Alpha House and the North College, facing North College Lane. The building is to cost $100,000, that sum having been donated by Andrew Carnegie, the other $100,000 having been raised by graduates to secure the Carnegie gift and will be added to the general endowment fund of the college. The building is to be four stories in height and will be 136 × 66 ft. It will be built so that an extension may be added at any time in the rear. The plans and specifications have been prepared by Fuller & Pitcher, Archs., 95 State St., Albany, N. Y., and bids for the work have been invited. The building must be ready for occupancy at the beginning of the college year in 1909. Noted on Aug. 27.

*POUGHKEEPSIE, N. Y.—Bids are asked until 3 p. m., Sept. 29, by the State Commission in Lunacy, Albany, for furnishing and installing four horizontal tubular boilers, at Hudson River State Hospital, Poughkeepsie, N. Y. T. E. McGarr is Secy. Comn.; F. B. Ware is State Arch., both at Albany.

JOHNSTOWN, PA.—The Rev Father John Martvon and the members of the Church Committee of St. Stephen's Slovak Roman Catholic Church, located in the Sixteenth Ward, have awarded to OVERDORFF & CO., of Morrellville, a contract for the erection of a $76,000 church at the corner of Chestnut St. and Fourth Ave. The Architect is Joseph Molitor, Jr., Journal Bldg., Chicago, Ill. The structure will front on Chestnut St. and will occupy the entire corner lot, which has a frontage of 53 ft. and a depth of 132 ft. Indiana limestone will be used in the church, which is to be covered with a tile roof. It will have one story, with a finished basement to be used for school entertainments. There will be two towers in the front of the building.

PHILADELPHIA, PA.—Watson, Huckel & Co., Archs., 1211 Walnut St., have awarded to WILLIAM STEELE & SONS, 1600 Arch St., a contract for the erection of a warehouse at the corner of 16th and Callowhill Sts., for C. C. Knight & Co., Inc., dealers in iron and steel. Work will be started at once. It will be six stories high, measuring 100 × 180 ft. The structural work will be of reinforced concrete with an exterior of brick.

The Lehigh Construction Co. has obtained a permit to erect 92 houses at a total cost of $219,000. They will be two stories high, with porch fronts and of modern construction throughout. The operation comprises houses on Somerset and Cambria Sts., between 27th and 29th, and on Marston and the numbered streets.

It is the intention to erect a 5-story public garage on a site 132 × 122 ft. at the corner of Broad and Fitzwater Sts., on which an option has been obtained. The estimated cost of the building is about $500,000. It will be directed by the Philadelphia Automobile Co., which has had plans prepared and obtained an approximate estimate of cost from the Continental Construction Co. The building will contain 287 rooms, in each of which two machines can be stored. Brick and concrete with an ornamental facade will be used in the building, which is to have a front of 122 ft. on Broad St. and a depth of 132 ft. A machine shop will be established on the first floor.

PITTSBURG, PA.—The contract for the construction of the Pittsburg Marine Hospital has been awarded to the HENRY SHENK CO., of Pittsburg, Pa., at $88,388 plus for sanitary glass in lieu of marble $2,800. Time, July 31, 1909. A complete list of bids was given on Aug. 27.

The T. C. Jenkins Estate will remove the old buildings at the corner of Penn Ave. and Fifth St. and erect a building to cover the entire lot. O. M. Topp, Arch., Westinghouse Bldg., is preparing the plans for the structure, which will cost over $100,000. The work will begin in the spring. The building will front 115 ft. in Penn Ave. and 120 ft. in Fifth St. and will be four stories high. Buff brick will be used. There will be six stories on the ground floor, and the upper stories will be divided.

ALLENTOWN, PA.—Plans for reconstruction of present high school will be received soon by the Board of Control of the Allentown School District. The plans proposed are for the first section of a structure to cost probably $100,000. The building will contain accommodations for all of the departments, including a manual training department and gymnasium. Competitive plans and specifications for the complete building will be received by the Building Committee, architects to be paid for their services according to the decision of the committee, $300 for the plan adopted, $200 for the next best plan, and $100 for the third best.

BALTIMORE, MD.—The city has rejected all bids for erection of school building at Reisterstown Road and Fifth Ave., and new bids will be asked for 24-room structure to cost about $120,000. Otto G. Simonson, American Bldg., is Arch.; Edward D. Preston, Inspector of Buildings, City Hall.

The city also has rejected all bids for erection of a school building at Mulberry and Payson Sts., and will ask for new bids for 24-room structure, to cost approximately $120,000. Theodore W. Pietsch, American Bldg., Baltimore, is Arch. Edward D. Preston, Inspector of Bldgs., City Hall, will superintend construction.

WASHINGTON, D. C.—Bids were received as follows Sept. 17, at the office of James Knox Taylor, Superv. Arch., Treasury Dept., Washington, D. C., for the construction of an extension to the bond vault in the Treasury Building, Washington: Debold Safe & Lock Co., Canton, Ohio, $19,340; Mosler Safe Co., Hamilton, Ohio, $11,460; York Safe & Lock Co., York, Pa., $22,500.

RICHMOND, VA.—Charles K. Bryant, of Richmond, has prepared plans and work will soon begin on erection of proposed temporary U. S. post-office building at Richmond, reported to cost about $100,000. Congress has appropriated $800,000 for a permanent Federal building. James Knox Taylor is Superv. Arch., Treasury Dept., Washington, D. C.

NORFOLK, VA.—Alvan H. Martin will erect a 4-story apartment house in Berkley Ward. There will be two stories on first floor, and twelve 5 and 6-room housekeeping apartments on upper floors. Approximate cost, $50,000. Lee & Diehl, Seaboard Bank Bldg., Norfolk, are Archs.

RALEIGH, N. C.—Bids are asked by W. A. Erwin, Chn. Bldg. Com., State Hospital Comn., West Durham, N. C., until Sept. 29 for construction, plumbing and heating of four buildings at State Hospital for Insane, Raleigh, and four buildings at State Hospital for Insane at Goldsboro, N. C., according to plans by Barrett & Thomson, Archs., Raleigh, N. C.

GREENWOOD, S. C.—Bids were received as follows Sept. 22 at the office of James Knox Taylor, Superv. Arch., Treasury Dept., Washington, D. C., for the construction of a post-office building at Greenwood, S. C.: Algernon Blair, Montgomery, Ala., $44,300; King Lumber Co., Charlottesville, Va., $47,870; Miles & Brodt Co., Atlanta, Ga., $46,666; Palmer Construction Co., Augusta, Ga., $51,500; Fred. Minshall, Abbeville, S. C., $42,550; Johnson & Mathews, Florence, S. C., $46,879; Wilmarth Building Co., 1 Madison Ave., New York, $47,989.

BIRMINGHAM, ALA.—Bids are asked until Oct. 10 by Warren & Welton, Archs., Title Guarantee Bldg., Birmingham, for the proposed Chamber of Commerce Building. It will be a 7-story fireproof structure, 100 × 100 ft., and 100 ft. high, of reinforced-concrete construction, with terra-cotta cornice to two lower stories and light brick facing. Cost, $120,000. Noted on Sept. 10.

AKRON, OHIO.—We are officially advised that the Osborn Engineering Co., Consult. Engrs., Osborn Bldg., Cleveland, Ohio, are preparing plans for a fireproof building, 60 × 200 ft., five stories and basement for the B. F. Goodrich Co. Contracts will be let at once.

YOUNGSTOWN, OHIO.—Bids were received as follows on Sept. 16, at the office of James Knox Taylor, Superv. Arch., Treasury Dept., Washington, D. C., for the construction of an extension to the post-office building at Youngstown, Ohio: W. W. Luyster, Dayton, Ohio, $91,295; Ed. Henry, South Bend, Ind., $95,000; John G. Unkefer & Co., Minerva, Ohio, $89,859; Bedford Stone Construction Co., Indianapolis, Ind., $86,459; James de Vault & Son, Canton, Ohio, $87,800; McHenry-Beatty Co., East Liverpool, Ohio, $91,892.

MARIETTA, OHIO.—Bids are asked by James Knox Taylor, Superv. Arch., Treasury Dept., Washington, D. C., until 3 p. m., Oct. 15, for the construction (including plumbing, gas piping, heating apparatus, electric conduits and wiring), of the U. S. post-office at Marietta.

MUNCIE, IND.—L. A. Guthrie, Mayor, announces that bids will be received for the construction of a city hall, 125 × 110 ft., of brick and stone, as soon as plans are completed by Cune Kibelle, Arch., Bluffton. Estimated cost, $100,000.

INDIANAPOLIS, IND.—The Commissioners of Marion County have asked for an appropriation of $250,000 for the construction of a county infirmary. Plans have been completed and bids will be received as soon as the appropriation is made.

ESCANABA, MICH.—Bids were received as follows on Sept. 17, at the office of James Knox Taylor, Superv. Arch., Treasury Dept., Washington, D. C., for the construction of a post-office at Escanaba, Mich.: Carl J. Lange & R. F. Hoffman, Appleton, Wis., $51,000; Andrew P. Wilson, Marquette, Mich., $63,900; Herbert T. Hazelton, Chicago, $58,900; General Construction Co., Milwaukee, Wis., $52,500; Northern Construction Co., Milwaukee, Wis., $53,000; Sterling Engineering & Construction Co., Milwaukee, Wis., $59,574; Escanaba Cement Works, Escanaba, Mich., $63,100.

PARIS, ILL.—Bids are asked until 3 p. m., Oct. 10, by James Knox Taylor, Superv. Arch., Treasury Dept., Washington, D. C., for the excavation and the construction of basement walls of the U. S. post-office at Paris, Ill.

CHICAGO, ILL.—The Lincoln Park Commissioners will build a 2-story field house and gymnasium in the new park at Vine, Rees and Vedder Sts., to cost $90,000. Perkins & Hamilton, Hartford Bldg., are Archs.

CHICAGO, ILL.—A building is to be erected in Chicago by the Peoples Gas Light & Coke Co. at a cost of $3,000,000. It will occupy the site of the present office building of the corporation at the corner of Michigan Boulevard and Adams St., as well as several adjacent frontages which recently have been purchased. Plans for the structure have been completed by D. H. Burnham & Co., Railway Exchange Bldg., Chicago. The building is to be 20 stories high, and will occupy a site that is 196 ft. on Michigan Ave. and 171 ft. on Adams St. E. G. Cowdery, Vice-Pres. of the Peoples Gas Light & Coke Co., states that the exterior will be of white unpolished tile. The work of preparing the site is to be begun as soon after Nov. 1 as possible.

*CARTHAGE, MO.—Bids are asked until 3 p. m., Oct. 30, by James Knox Taylor, Superv. Arch., Treasury Dept., Washington, D. C., for the construction (including plumbing, gas piping, heating apparatus, electric conduits and wiring) of the U. S. post-office at Carthage.

ST. LOUIS, MO.—THE BEDFORD STONE & CONSTRUCTION CO., of this city, has been awarded a contract by James Knox Taylor, Superv. Arch., Treasury Dept., Washington, D. C., for the construction of the St. Louis post-office building. Contract price, $865,000. The plan is to use face brick and ornamental terra-cotta for facing. The right is reserved to accept the proposal for facing the building with pink granite for $98,000 additional, or with gray granite for $91,000 additional on or before April 1, 1909. A list of bids was given on Sept. 17.

KANSAS CITY, MO.—The Odd Fellows Building Association, H. B. Brisbane, Secy., 1710 McGee St., will expend $40,000 on building to have three stories and basement, 50 × 141½ ft., hot-water heat, electric lighting, for stores, lodgerooms, etc. Rudolf Markgraf, Keith & Perry Bldg., Kansas City, are Archts. Date of opening bids not decided.

LITTLE ROCK, ARK.—The State Bank Building Co., Chas. McKee, Pres., will award contract about Nov. 1 for erection of a 12-story bank and office building, for which George R. Mann, Little Rock, has prepared plans. It will be of fireproof construction and will cost $225,000 to $250,000.

LITTLE ROCK, ARK.—Bids were received as follows on Sept. 21, at the office of James Knox Taylor, Superv. Arch., Treasury Dept., Washington, D. C., for the construction of an extension of the post-office at Little Rock, Ark.: J. P. Cullen Co., Janesville, Wis., $116,372; Charles W. Clark, Little Rock, Ark., $111,500; John Borden, Little Rock, Ark., $107,300; King Lumber Co., Charlottesville, Va., $119,000; Northern Construction Co., Milwaukee, Wis., $112,934; Patrick Powers, Little Rock, Ark., $111,300. Time to complete, Jan. 1, 1910.

HOUSTON, TEX.—We are officially advised that the contract for constructing the Harris County court-house at Houston has been awarded to H. L. STEVENS CO., Knoxville, Tenn., and Houston. The approximate cost of the building is $500,000. Building will be faced with granite and brick, and with reinforced concrete floors.

GALVESTON, TEX.—Bernard Tiernan will erect an office building with twelve stories, 76 × 51 ft., concrete. Estimated cost, $250,000. Plans and specifications are being prepared.

DALLAS, TEX.—B. M. Burgher will erect two brick-veneer apartment-houses costing $55,000 each. Hubbell & Greene are Archs.; H. P. SELF is contractor, both of Dallas.

ANADARKO, OKLA.—See item under Light and Power Plants.

LA JUNTA, COLO.—La Junta Elks are planning to build a club house which will cost $50,000. Two lots have been obtained. The Building Committee, consisting of E. W. McDaniel, R. C. Todd and Harry T. O'Connor, have incorporated a building association and will have charge of the construction of the building.

PUEBLO, COLO.—Bids are asked until Oct. 2 by the Board of County Commissioners for the construction of the $400,000 court-house. The Commissioners will tear down and remove to the County Farm one of the old court-houses.

TACOMA, WASH.—Darmer & Cutting, Inc., Archs., 1111 South C St., have prepared plans for an 8-story furniture repository, 150 × 120 ft., for the Continental S. L. & C. Co. Estimated cost, $125,000.

SEATTLE, WASH.—Contracts will be let about Nov. 1 for erecting a 3-story church for the members of the First Baptist Church on Madison St., according to plans by Ripley & Russell. Probable cost, including furnishings, $250,000.

LOS ANGELES, CAL.—A club building will be erected at the corner of Second and Hill Sts. for the Union Leage within the next four months. Contract has been let to F. L. SPAULDING. The building will cost approximately $250,000.

SAN FRANCISCO, CAL.—A 7-story steel frame building will be erected at once by L. B. & J. Feigenbaum on their lot on the corner of Kearny and California Sts. The ground floor will have four stories with offices above. Pressed brick and terra-cotta will be the materials used. It is estimated to cost $75,000.

VANCOUVER, B. C.—Competitive plans will be received until Oct. 1 by the Canadian Pacific Trust & Investment Co. for a 6-story and basement apartment block.

MONTREAL, QUE.—The congregation of St. Aloysius parish will erect a church at Nicolet and Stadacona Sts. at a cost of $40,000. J. A. Karch, 117 Place d'Armes, is Arch.

WATER SUPPLY—IRRIGATION.

(** denotes that this work is advertised in Engineering News.*)

*SPRINGFIELD, MASS.—The T. A. GILLESPIE CO., 90 West St., New York, N. Y., has been awarded contract for 1,821 ft. 54-in. steel pipe 5/16-in. f. o. b. cars Westfield, Mass., at $10,470. List of bidders noted on Sept. 17. E. E. Lochridge is Ch. Engr. Water Bd.

C. E. Lochridge, Ch. Engr., Bd. Water Comrs., writes us that errors have been discovered in the list of bids for about 12 miles of 42-in. pipe sent us and published last week. In the corrected schedule the bid of the Riter-Conley Mfg. Co., Leetsdale, Pittsburg, Pa., is $401,380 for steel pipe and $437,391 for w.-i. pipe, and the Gillespie Co. for 54-in. pipe is $10,470.

*GARDNER, MASS.—We are officially advised that bids were received as follows on Sept. 18 for laying 6,000 lin. ft. c.-i. water pipe, State Colony for the Insane: (A) laying pipe, (B) rock excavation: W. J. RAFFERTY & CO., 7 Water St., Boston, Mass., (A) 27.5 cts. per ft., (B) $3.95 per cu. yd. (awarded contract); Bryne Contracting Co., Boston, Mass., (A) 35 cts., (B) $4; Jennison Co., Fitchburg, Mass., (A) 79 cts., (B) $3; T. Bruno, Boston, Mass., (A) 38 cts., (B) $3.50; Edwin A. Taylor, Uxbridge, Mass., (A) 40 cts., (B) $4; Francis J. Mague, West Newton, Mass., (A) 48 cts., (B) $3.25.

*WALLINGFORD, CONN.—A. B. GRISWOLD, New Britain, Conn., has been awarded the contract for laying approximately 800 lin. ft. 15-in. vitrified pipe, 2,500 lin. ft. 10-in. and 4,200 lin. ft. 8-in. c.-i. water pipe, and excavating about 1,000 cu. yds. of rock and 50 cu. yds. of earth, at $4,470. List of low bidders noted last week.

*ROCHESTER, N. Y.—Bids are asked until 3 p. m., Sept. 30, by the State Commission in Lunacy, Capitol, Albany, N. Y., for apparatus for water supply for Rochester State Hospital. Drawings and specifications may be consulted and blank forms of proposal obtained at the Rochester State Hospital, Rochester, or at the office of the State Architect. Complete sets of plans and specifications will be furnished to prospective bidders upon reasonable notice to, and in the discretion of, the State Architect. Franklin B. Ware, State Arch., Albany, N. Y. T. E. McGarr is Secy. Comn.

*MARCELLUS, N. Y.—Bids are asked until 2 p. m., Sept. 30, by the Board of Trustees for the construction of a water-works system. F. W. Knapp is Clk. Bd.; Morrison & Farrington, Inc., Syracuse, N. Y., are Engrs.

*VERNON, N. J.—Through a typographical error in the specifications the date for awarding contracts was given as Oct. 28 instead of Sept. 28 for water-works construction.

JUNIATA, PA.—Bids will be received until Sept. 24 by H. C. Gwin, Engr., Juniata Boro., Altoona Trust Bldg., Altoona, Pa., for furnishing material and constructing a reservoir on the Homer and Sandy Gap streams.

PARKERSBURG, PA.—The borough proposes to increase its water supply. Plans have been approved by the State Health Department.

CONWAY, PA.—James P. Leaf, of Rochester, is preparing plans for the construction of water-works. Estimated cost, about $20,000. Frank S. Brown is Boro. Secy.

WASHINGTON, D. C.—The Commissioners of the District of Columbia have ordered the following water mains laid: 800 ft. of 8-in. in Second St., N. W.; 110 ft. of 8-in. in Adams St.; 219 ft. of 8-in. in Railroad Ave.; 279 ft. of 8-in. in Allison St., N. W.; 165 ft. of 8-in. in L St.; 165 ft. of 8-in. in the west side of Sherman Ave.; 140 ft. of 8-in. in Fairmont St.; 335 ft. of 8-in. in Brentwood Road; 335 ft. of 8-in. in the north side of Rhode Island Ave.

UNIVERSITY, ALA.—The University of Alabama, John W. Abercrombie, Pres., has awarded contracts for the construction of water-works as follows: R. D. COLE MFG. CO., Newman, Ga., for constructing tower and tank; CRANE & CO., of Birmingham, Ala., for furnishing and installing valves and hydrants; AMERICAN CAST-IRON & PIPE CO., of Birmingham for furnishing c.-i. pipe and pipe fixtures; TUSCALOOSA PLUMBING CO., Tuscaloosa, Ala., for furnishing remainder of supplies and doing remainder of work. Total cost, $14,000.

GREENVILLE, ALA.—The city has voted the issuance of $23,000 of bonds to purchase the water-works.

JACKSON, MISS.—Bids are asked until 3.30 p. m., Oct. 6, by the City Clerk, for furnishing hydrants, valves and valve-boxes for 20 miles of new water mains; for furnishing manhole castings for nine miles of sewers, and for laying the c.-i. water mains and vitrified clay sewer pipe embraced in these extensions. Plans on file at the office of the City Clerk and specifications furnished on application. Hamilton Johnson is City Engr.

WINNFIELD, LA.—The city has awarded contracts for the construction of water-works as follows: WILLIAM LUCK & CO., New Orleans, La., for boilers, engine, pumps and air compressors; AHRENS & OTT MFG. CO., Louisville, Ky., lead and pipe; DIMMICK PIPE CO., Birmingham, Ala., piping. C. McGinty is Clk.

GREENVILLE, KY.—The Greenville Light & Water Co. has voted to issue $12,000 of bonds for the extension of water mains, lighting circuit, and other improvements.

ST. HENRY, OHIO.—We are officially advised that the Council will receive estimates from engineers for the construction of water-works here.

EAST LIVERPOOL, OHIO.—Bids will be received until Sept. 30 by the Board of Public Service, A. S. Hughes Clk., for furnishing two horizontal standard Scotch boilers 80 HP. each, with necessary fittings and the placing of same in the water-works pump No. 2.

WOLCOTTVILLE, IND.—Bids will be received by the Board of Town Trustees until Sept. 25 for the construction of water-works here.

CRAWFORDSVILLE, IND.—The City Council has ordered plans for the complete remodeling and repair of the water-works plant.

CHICAGO, ILL.—Bids will be received until 11 a. m. Sept. 26 by John J. Hanberg, Comr. Pub. Wks., for furnishing the material and constructing steam and exhaust lines to the electric engines at the Lawrence Ave. pumping stations.

CHICAGO, ILL.—We are officially advised that bids were received on Sept. 8 by the Cook County Commissioners for the construction of a water-works system at Oak Forest and the contract was awarded to the W. H. CATER CO.

DECATUR, ILL.—Bids are asked until 8 p. m., Sept. 28, by Albert Leach, City Clk., for 225 tons of c.-i. pipe and special castings, from 6 to 30-in. internal diameter; 15 valves, from 6 to 30-in. diameter.

COLUMBUS, WIS.—Bids were opened on Sept. 1 for the construction of a sewerage system. The contract has been awarded to W. H. STARE, of Waukesha, at the following prices: 5,989 ft. 6-in. sewer pipe, 35 cts.; 2,616 ft. 8-in. 49 cts.; 1,130 ft. 10-in., $2.23; 2,266 ft. 12-in. 61 cts.; concrete septic tanks, 76 × 33 × 8 ft. high, $3,275; 30 manholes, each, $29, and four lampholes, each, $7.50. Total, $11,307. Other bidders were: Chicago Drainage & Construction Co., Chicago, Ill., $14,003; R. Nelson, Racine, $12,898; W. A. Harley, Beaver Dam, $12,014; F. E. Kaunnski, Berlin, $13,425; C. Johnson, Oshkosh, $15,107; E. R. Harding, Racine, $12,426; N. F. Reichert, Racine, $13,307; C. C. Sauer, Chicago, Ill., $12,063; W. C. Fraser, Rochester, Minn., $17,137; O'Neil & Preston, St. Paul, Minn., $17,954. E. B. Parsons, Watertown, Wis., is Engr.

BEMIDJI, MINN.—Bids are asked until 8 p. m., Sept. 28, by Thomas Maloy, City Clk., for the construction of a steel tower 120 ft. high, supporting a steel hemispherical bottom tank of 100,000 gallons capacity. M. D. Stoner is City Engr.

DEER RIVER, MINN.—Bids are asked until 8 p. m., Sept. 28, by Will Taylor, Village Recdr., for labor and materials for laying two 6-in. c.-i. water mains, 1,335 ft. and 1,443 ft. long.

KIOWA, KAN.—Bids are asked until 5 p. m., Oct. 2, by C. H. McBrayer, City Clk., for material and labor, except c.-i. pipe, hydrants and valves, electrical machinery, pumping machinery, steam engine and constructing a water-works and electric light system. Separate bids are also asked for furnishing c.-i. pipe, hydrants, two 500-gallon per min. steam pumps and one 200-gal. per min. triplex power pump, generator switch board, motor transformers and arc lamp, 125 HP. high-speed engine, and for furnishing material and erecting steel tower and tank, 70,000 gallons capacity, 100 ft. high. Burns & McDonnell are Engrs., Scarritt Bldg., Kansas City, Mo.

GOTHENBERG, NEB.—We are officially advised that the DES MOINES BRIDGE & IRON CO., Des Moines, Iowa, has been awarded the contract at $26,990 for the construction of water-works here. Bids were opened on Sept. 10. C. F. Williams is City Clk.

BELLE FOURCHE, S. DAK.—The Secretary of the Interior has authorized the Reclamation Service to award the following contracts in connection with the Belle Fourche irrigation project, South Dakota: To J. E. HILTON, of Vale, S. Dak., for the construction of a portion of the lateral system involving the excavation of approximately 103,000 cu. yds. of material, at $17,843; J. W. McNEIL and H. CHAMBERS, a portion of the lateral system, involving the excavation of 9,000 cu. yds. of material. Contract price, $5,716.

*PLATTE, S. DAK.—Bids were opened as follows on Sept. 2 by the city for erecting a 125-ft. steel water tower with steel tank and furnishing and laying about 11,424 ft. of 4, 6 and 8-in. water mains, 15 hydrants, 12 valve boxes: Morava Construction Co., 85th St. and Stewart Ave., Chicago, Ill., $13,398; Western Engineering Co., Yankton, S. Dak., $15,900; Curran & McMillan, Fort Pierre, S. Dak., $16,413; F. J. Gray & Co., Minneapolis, Minn., $16,000; James Kennedy, Fargo, N. Dak., $15,709; The Sykes Co., Minneapolis, $16,850. W. F. Vander Voort is City Audr.

GRAND FORKS, N. DAK.—Bids will be received until Oct. 5 by the City Council for constructing a water main in a portion of De Mers Ave. W. H. Alexander is City Audr.

CODY, WYO.—The contract has been awarded to the IOLA PORTLAND CEMENT CO., of Iola, Kan., for furnishing 40,000 bbls. of cement for use in connection with the Shoshone irrigation project, Wyoming. This cement is to be delivered f. o. b. cars at Iola, at 64 cts. per bbl.

GLENDIVE, MONT.—The contract has been awarded to WILLIAM J. HOY, of St. Paul, Minn., for the reconstruction of a portion of the main canal, Lower Yellowstone Irrigation project, Montana-North Dakota. The work involves the excavation of approximately 16,000 cu. yds. of excavation, and the contract price is $2,969.

ANADARKO, OKLA.—See item under Light and Power Plants.

OTOE, OKLA.—Bids are asked until 2 p. m., Oct. 7, by the Commissioner of Indian Affairs, Washington, D. C., for furnishing materials and labor for constructing a tank and tower, water main, etc., at the Otoe Indian School, Okla. Jacob Breid is Supt., Otoe, Okla.

WETUMKA, OKLA.—The contract for installing water and electric-light systems has been awarded to the O'NEILL ENGINEERING CO., Dallas, Tex. Surveys are being made and the work will be completed within 120 days.

CANON CITY, COLO.—Plats showing an amended survey of De Weese reservoir No. 2, the De Weese diverting pipe tunnels and De Weese reservoir No. 6 were filed on Sept. 14 in the County Clerk's office by Dall De Weese. Reservoir No. 2 is located on Grape Creek, about ten miles above Canon City. The dam will be 196 ft. high by 200 ft. long, and will be constructed between two perpendicular walls of granite in a narrow canon of the creek. The total capacity of the reservoir will be 663,568,355 cu. ft. of water. The body of water will be two miles long by a half-mile wide. A system of pipe lines and tunnels will conduct the surplus water from reservoir No. 2 to reservoir No. 6, which will be constructed in another canon to a dam 90 ft. high by 400 ft. long, having a total capacity of 51,695,440 cu. ft. of water. Estimated cost of system, $175,000.

CASHMERE, WASH.—The plans and specifications for the construction of water-works here have been completed by C. C. Ward, Engr.-in-Charge, and call for the installation of a pumping plant in the Wenatchee River near that city w[illegible] distributing mains and a large reservoir. [illegible]ds for $7,500 have been issued to estab[illegible] the plant, and bids will soon be asked.

WENATCHEE, WASH.—The [illegible]rian Irrigation Co., 424 Mohawk B[illegible] Spokane, which is developing 5,000 ac[illegible] near Wenatchee into fruit lands, has d[illegible]d to build a pipe line across the Great N[illegible]ern R. R. instead of a flume, as first i[illegible]ded, at an expense of about $4,000.

ASTORIA, ORE.—Bids are [illegible]ked until noon, Oct. 2 by the Water Co[illegible]ion, C. S. Wright, Chn., for constructin[illegible] 20,000,000-gallon reservoir, the work in[illegible]g 165,000 cu. yds. earth excavation and [illegible]bankment 3,100 cu. yds. reinforced co[illegible]e, etc. J. G. Kelley is Engr., Chamber [illegible] Commerce, Portland, Ore.

PENDLETON, ORE.—Frank [illegible] Kelsey, of Portland, Ore., is preparing pr[illegible]inary surveys and estimates for the co[illegible]ction of a gravity system of water-works.

ORLAND, CAL.—The Secret[illegible] of the Interior has awarded the contract [illegible]he STANLEY CONTRACTING CO., [illegible] San Francisco, Cal., for the constructi[illegible] the East Park dam, spillway and dikes [illegible] connection with the Orland irrigation pr[illegible]t, California. This work involves the pl[illegible]g of about 13,500 cu. yds. of concrete and the excavation of about 8,500 cu. yds. of [illegible]aterial. It is located about 12 miles no[illegible]west from Sites. The bid of the contrac[illegible] company amounts to $79,882.

SALT LAKE CITY, UTAH.—[illegible] Secretary of the Interior has authorized [illegible]e engineer in charge of the Strawberry i[illegible]ation project, Utah, to award a contract [illegible] J. W. G. STEBBINS, of Spanish Fork, [illegible]h, for the construction of two brick dwell[illegible] houses in connecting with the power system. The contract price is $3,525.

SEWERAGE.

(** denotes that this work is advertised in Engineering News.*)

BATH, ME.—The HANSCOM CONSTRUCTION CO., Exchange Bldg., Boston, Mass., has been awarded the contract for constructing concrete block sewers at $25,975. S. Litchfield is City Engr.

TORRINGTON, CONN.—The PIERSON CONSTRUCTION CO., of Bristol, Conn., has been awarded the contract for the construction of the outfall sewer from Church St. along the river, at $45,060. The next lowest bid was $46,810.

WALLINGFORD, CONN.—The Borough is planning to instal approximately 800 ft. of storm water sewer, 15 and 18 ins. in diameter. Samuel H. McKenzie, Southington, Conn., is Engr.

HARTFORD, CONN.—The plans of H. R. Buck, State Engr., for the septic sewage system at the Soldiers' Home, Norton Heights, Conn., have been accepted, and the system will be constructed under his supervision. The Legislature appropriated $4,000 for this work.

*WEST POINT, N. Y.—Plans and specifications are on file at the office of Engineering News, New York, for the construction of a storm brick sewer. Bids are asked until Sept. 29.

*RYE, N. Y.—Bids are asked by the Village Trustees until 8 p. m., Oct. 28, for the construction of certain sanitary sewers and of a sewage disposal plant. G. Everett Hill, 156 Fifth Ave., New York, is Engr.

HACKENSACK, N. J.—Bids were opened on Sept. 8 by the Hackensack Improvement Commission, C. Linkroum, Pres., for constructing the Poplar Ave. sewer. The contract was awarded to JAMES J. FUSCO, of Newark, N. J., at $9,390. Other bidders were: John Vandeusen, New Brunswick, $9,616; John Puglia, Paterson, $9,981; Culp & McCauley, Brooklyn, N. Y., $10,756; Peter Luciano, White Plains, N. Y., $11,178; James A. Christie, Newark, $11,782; E. C. Humphrey & Co., Hackensack, $12,344; Ernest Abraham, Hackensack, $13,892; F. R. Long, Hackensack, $17,246.

NEW CASTLE, PA.—An ordinance was passed on Aug. 31 by the Select Council providing for the construction of the Fifth Ward sewer. Estimated cost, $12,000.

NEW WILMINGTON, PA.—The Council on Sept. 1 passed an ordinance providing for the issuance of $8,000 of bonds for sewer construction.

BRACKENRIDGE, PA.—George B. Campbell has been instructed to prepare plans for the construction of a sewage disposal plant here, as the State Board of Health has ordered the construction of this plant at once. The plans will be prepared and submitted to the State for approval, and it is thought that contracts will be awarded this fall for its construction. The plant will be constructed almost entirely of concrete.

BALTIMORE, M. D.—The Sewerage Commission on Sept. 15 approved specifications for constructing the sprinklers, sludge tanks and settling basins in connection with the disposal plant at Back River. They will be built of reinforced concrete. There will be four sprinklers, four sludge tanks and two settling basins. Estimated cost, $700,000. B. T. Fendall is City Engr.

CHARLESTON, W. VA.—We are officially advised that a large amount of sewer work is contemplated by the city. W. A. Hogue is City Engr.

ATHENS, GA.—The city will soon begin the construction of a main sewer through the northern and northwestern sections of the city. A. Barnett is City Engr.

ANNISTON, ALA.—Bids are asked until Sept. 24 for the construction of a sanitary terra-cotta sewer in alley from Block B to 19th St.

FLORENCE, ALA.—The city contemplates extending the sanitary sewer system.

LUVERNE, ALA.—The city has voted bonds for the construction of a sewer system and waterworks.

NEW ORLEANS, LA.—The following contracts for material for the Sewerage and Water Board have been awarded: Brick—The MUTUAL BRICK & SUPPLY CO., $9,540; cement, the CAROLINA PORTLAND CEMENT CO., $3,082; sand, FRITZ JAHNCKE, $1,419; pipe, large pipe, ALLEN TUPPER, $17,054; small pipe, same, $28,942; paving gravel, FOSTER CREEK CONCRETE GRAVEL CO.; lumber, G. H. A. THOMAS, $11,394.

NATCHITOCHES, LA.—We are officially advised that the contract for the construction of a sewerage and sewage disposal system has been awarded by the Board of Administrators to WESSELL & CO., Shreveport, La. Bids were opened on Sept. 16. Ira W. Sylvester is Engr., Alexandria, La.; J. B. Aswell is Pres. Bd.

*LOUISVILLE, KY.—Bids are asked until noon, Oct. 9, by the Commissioners of Sewerage for the construction of the Green St. sewer, Contract 12 of the comprehensive system of sewerage for the city. The work consists mainly of constructing a sewer of concrete as follows: 550 ft., 36 ins. in diameter; 1,330 ft. 24 ins. in diameter, average depth of cut about 13 ft.; approximately 325 cu. yds. of concrete.

Bids are asked until Oct. 21 for constructing Section E of the southern outfall sewer construction. J. B. F. Breed is Ch. Engr.

DAYTON, OHIO.—Bids are asked until noon, Oct. 2, by the Board of Public Service for the construction of storm sewers in Connecticut, Indiana and Grove Aves., from Illinois Ave. to Virginia Ave. William Budroe is Clk. Bd.

CLEVELAND, OHIO.—THOMAS W. NICHOLSON has been awarded the contract at $124,320 for the construction of a portion of the intercepting sewer between East Fortieth St. and Marquette Ave., N. E.

MASSILLON, OHIO.—Bids will be received by the Board of Public Service, Schworm Block, until noon, Sept. 25, for the construction of sanitary sewers on various streets. H. L. Leahy is Pres. Bd.

STEUBENVILLE, OHIO.—Bids are asked until noon, Sept. 28, by the Board of Public Service for the construction of a vitrified pipe sewer. H. G. Simpson is Clk. Bd.

SOUTH BEND, IND.—The Board of Public Works has ordered plans for the construction of a sewer in West Wayne St., from Franklin to Taylor Sts. Bids will be asked soon. Nelson Keyser is Clk.

EVANSVILLE, IND.—JOHN L. NEWMAN has been awarded contract for the construction of the following sewers: Between Franklin and Michigan, from Baker to Garfield Sts.; between Virginia and Iowa, from Governor to Lafayette Sts.; between Columbia and Maryland, from Heidelbach to Lafayette Sts.; between Wabash and Tenth, from Iowa to Delaware Sts.; between Delaware and Columbia, from Governor to Lafayette Sts., at $1.25 and $1.50.

COLUMBUS, IND.—LEE & EVERROAD, of Columbus, were awarded the contract by the City Council on Sept. 14 for the construction of the Mechanic St. sewer at $13,344.

CHICAGO, ILL.—The contract for the construction of the Kedzie Ave. sewer from 71st St. to the Drainage Canal has been awarded by the Board of Local Improvements to T. L. RYAN & CO., at $303,073. J. J. Hanberg is Comr. Pub. Wks.

ELGIN, ILL.—The lowest bid opened on Sept. 10 by the Board of Local Improvements was that of the Chicago Drainage Co., 124 East Quincy St., Chicago, Ill., at $81,186.

JANESVILLE, WIS.—The Peoples' Construction Co., Davenport, Iowa, are the lowest bidders at $45,000 for the construction of a main outlet sewer. A. E. Badger is City Engr.

MILWAUKEE, WIS.—Bids are asked until 10.30 a. m., Sept. 24, by the Board of Public Works, Charles J. Poetsch, Chn., for constructing house drain and water service connections in Downer Ave.

CHEROKEE, IOWA.—Bids are asked until 8 p. m., Oct. 6, by W. Shardlow, Jr., City Clk., for constructing an 8-in. sanitary sewer in Block No. 1, Millard Addition. W. Shardlow, Jr., is City Clk.

FORT DODGE, IOWA.—Bids are asked until 5 p. m., Sept. 28, by the City Council for the construction of a sanitary sewer. Kink E. Beal is City Clk.

FORT SNELLING, MINN.—The lowest bid opened on Sept. 11 at the office of the Constructing Q. M., U. S. A., for putting in drain pipes and grading at the Fort Snelling target range, has been submitted by Dale & Baumgardner, Scandinavian-American Bank Bldg., St. Paul, Minn., at $13,202. This bid has been recommended for acceptance.

LAWRENCE, KAN.—Bids are asked until 5 p. m., Oct. 5, by F. D. Brooks, City Clk., for the construction of main sewers requiring about 6,000 ft. of 12-in. vitrified sewer pipe and four manholes and about 1,500 ft. of 15-in. vitrified sewer pipe and two manholes.

HOLDREDGE, NEB.—The contract for constructing a sewer here has been awarded by Council to LANG & BROWITT, of University Pl., at $18,785.

LAWTON, OKLA.—The city will extend the sewer system to Woods, Beal and Mountain View additions. Estimated cost, $30,000.

PAULS VALLEY, OKLA.—The contract for the construction of a sanitary sewer system here has been awarded to the ARDMORE CONSTRUCTION CO., Ardmore, at $15,930.

ANADARKO, OKLA.—See item under Light and Power Plants.

SEATTLE, WASH.—Bids will be received by the city until Sept. 26 for the improvement of Mount Baker Boulevard and other streets, by constructing sewers. Estimated cost, $121,000. List of approximate quantities are on file at the office of Engineering News, New York.

SEATTLE, WASH.—R. H. Thomson, City Engr., has reported the estimated cost of the following street improvements: Bagley Ave. and other streets, sewers, $28,200; West 48th St., sewers, $5,350.

DALLAS, ORE.—VENSKE & TAYLOR of Cottage Grove, have secured the contract for laying 19,000 ft. of sewer pipe here at $17,984.

SAN FRANCISCO, CAL.—About $3,000,000 will be expended by the Board of Public Works for the construction of concrete, brick and iron stone pipe sewer here. Marsden Manson is City Engr.

REDONDO, CAL.—We are officially advised that the CALIFORNIA ORNAMENTAL BRICK CO. was awarded the contract on Sept. 16 by the city for the construction of an outfall sewer line consisting of 3,810 ft. 10-in. c.-i. pipe, 2,263 ft. 16-in. vitrified pipe, at $8,064. Charles J. Creller is City Clk.

STREETS AND ROADS.

(** denotes that this work is advertised in Engineering News.*)

BOSTON, MASS.—James Doherty has submitted the lowest bid for wood block paving on Washington and Congress Sts., at $4,736 and $5,348, respectively.

HARTFORD, CONN.—Bids for the construction of state road work will be received at the office of the State Highway Commissioner, 2 p. m., Sept. 29, as follows: Town of Watertown, 4,874 lin. ft. grading, with one 24-in. and one 15-in. tile culvert; town of Norwich, 800 lin. ft. macadam, with one 15-in., three 24-in. and two 20-in. tile culverts; town of Oxford, 1,350 lin. ft. grading; town of Franklin, 8,100 lin. ft. gravel, with one 12-in., one 20-in., and one 24-in. tile culverts, on the Windham Road; town of North Stonington, 10,600 lin ft. gravel-telford, with one 15-in., one 20-in., two 18-in. and one 24-in. tile culverts; town of Woodbury, 620 lin. ft. of grading; town of Lyme, 2,350 lin. ft. grading, with two 12-in. and one 15-in. tile culverts.

The following contracts for state road work, bids for which were opened at the office of the State Highway Commissioner Sept. 21, have been awarded: Town of Montville, 2,100 lin. ft. macadam-telford road, to LANE CONSTRUCTION CO., Meriden, at $2.19 for macadam and $2.89 for telford, for native stone on bottom courses. Other bidders (for all trap rock) were: A. Brazos & Sons, Middletown, $2.65 and $3.00; A. Bridge's Sons, Hazardville, $3.17 and $3.67; two 12-in. tile culverts required; town of Sprague (Baltic post-office), 2,100 lin. ft. macadam-telford road, to AMOS BRIDGE'S SONS at $1.85 for macadam and $2.45 for telford. Other bidder, A. Brasoz & Sons, Middletown, $2.15 and $2.65; town of Preston, 2,425 lin. ft. gravel, to AHERN BROS., Putnam, at $1.59 per lin. ft. Other bidder, A. Brazos & Sons, Middletown, $2.15; one 15-in. and one 24-in. tile culvert required.

HARTFORD, CONN.—The contract for the construction of about 1,750 lin. ft. of telford road in the town of Chester has been awarded by the State Highway Commissioner to DONOHUE BROS., Middletown, at 65 cts. per lin. ft. This is in addition to $1.28 per lin. ft. for macadam.

Contracts for the construction of state roads, bids for which were opened at the office of the State Highway Commissioner on Sept. 19, have been awarded as follows: Town of Wethersfield, 1,350 lin. ft. macadam, to R. B. DAVIS, 18 Brown St., Hartford, at $1.40 per lin. ft. Other bidders were Thos. Kearney, Meriden, $1.92; Joseph Mascetti, Torrington, $2.20; A. Brazos & Sons, Middletown, $2; town of Westport, 4,777 lin. ft. gravel and gravel-telford and rubble drain, to the B. D. PIERCE, JR., CO., Bridgeport, $1.19 per lin. ft. for gravel; $2 per lin. ft. for gravel-telford, and $1 per lin. ft. for rubble drain; other bidders were E. N. Clarke, Milford, $1.89, $2.65, $1; Pierson Engineering & Construction Co., Bristol, $1.75, $2.25, $1; town of Fairfield, 6,603 lin. ft. macadam and macadam-telford road, to the CONNECTICUT CONTRACTING CO., 84 Temple St., Fairfield, Conn., at $1.54 for macadam, $2.19 for macadam-telford, 60 cts. per sq. yd. for cobble gutters and $3.50 per cu. yd. for retaining wall. Other bidders were: Pierson Engineering & Construction Co., Bristol, $1.99, $2.36, 60 cts., $6; B. D. Pierce, Jr., Co., Bridgeport, $1.58, $2.25, 60 cts. and $5.50; town of Newington, two sections Elm Hill section, 3,755 lin. ft. macadam and macadam-telford, to JOSEPH MASCETTI, Torrington, at $1.39 for macadam and $2.05 for macadam-telford. Other bidders were: O. T. Benedict, Pittsfield, Mass., $2.05, $2.75; Amos Bridge's Sons, $1.81 and $2.51; Pierson Engineering & Construction Co., Bristol, $1.59 and $2.19; F. T. Ley Co., Springfield, Mass., $2 and $2.50; Connecticut Contracting Co., Hartford, $1.98 and $3; A. Brazos & Sons, Middletown, $1.92 and $2.57; F. Arrigoni & Bro., Durham, $2.10 and $3; New Britain Road section, 6,925 lin. ft. macadam and macadam-telford, to the TOWN OF NEWINGTON, J. H. Fish, First Selectman, at $1.48 per lin. ft. for macadam and $1.83 for macadam-telford. Other bidders were: O. T. Benedict, $2.09 and $2.79; Amos Bridge's Sons, $1.93 and $2.73; Pierson Engineering & Construction Co., $1.98 and $2.58; Joseph Mascetti, $1.69 and $2.60; F. T. Ley Co., $2.07 and $2.60; Connecticut Contracting Co., $1.65 and $2.66; A. Brazos & Sons, $2.30 and $2.98.

WEST SENECA, N. Y.—Bids are asked until Sept. 24 by Edward H. Cosgrove, Town Clk., West Seneca, for constructing about 14,000 sq. ft. of concrete sidewalks, including grading, on Clinton St., in the Village of Gardenville, Town of West Seneca.

FORT WOOD, N. Y.—Bids are asked until 10:45 a. m., Oct. 1, by William W. Beasell, Constructing Quartermaster, U. S. A., for sodding and repairing terrace at this post.

NEW YORK, N. Y.—Bids are asked by Allen N. Spooner, Comr. of Docks, until noon, Oct. 5, for furnishing all the labor and materials required for repairing asphalt pavement on North and East rivers, together with all work incidental thereto.

NEW YORK, N. Y.—See item under Buildings.

*WESTFIELD, N. J.—Bids are asked until 8.15 p. m., Oct. 5, by the Town Council for macadamizing, guttering and constructing culverts on certain streets. Lloyd Thompson is Town Clk.

*BAYONNE, N. J.—Bids are asked until 8 p. m., Oct. 6, by the City Council for all the labor and materials for the improvement of Broadway from First St. to the Morris Canal. Bids will be received for paving with either bitulithic or asphalt block pavement, approximately 73,800 sq. yds. F. W. Dalrymple is City Surv.

CLEARFIELD, PA.—Bids are asked until Oct. 6 by State Highway Dept., Harrisburg, Pa., for constructing 14,175 ft. of state road in Decatur Township, Clearfield County.

YORK, PA.—Bids are asked until Oct. 1 by State Highway Dept., Harrisburg, Pa., for constructing following state roads in York County: Carroll Township, two roads, 5,180 ft. and 3,850 ft.; Washington Township, 3,252 ft.; Warrington Township, two roads, 7,920 ft. and 10,480 ft.

MERION, PA.—We are officially advised that THEOBOLD HARSCH of Narberth, Pa., was awarded the contract on Sept 18 by Weeks & Sanville, Engrs., 1708 Sansom St., Philadelphia, Pa., for repaving telford road and constructing a cement gutter on Hazelhurst Ave.

ELKTON, MD.—The Cecil County Road Commission has awarded the contract to E. WARD BROWN of Elkton at $19,955 for constructing a road from North East to Bay View.

BALTIMORE, MD.— W. M. ELDER, 220 St. Paul St., Baltimore, has been awarded the contract at $31,675 for paving 31st St., from Charles St. to York Road with sheet asphalt and at $76,777 for paving a portion of Gorusch Ave. with bitulithic on bituminous base. B. T. Fendall is City Engr.

FROSTBURG, MD.—The H. C. Brooks Co., of Fairmount, W. Va., have submitted the lowest bid at $7,708 for paving Broadway with brick. William Harvey is City Engr.

PARKERSBURG, W. VA.—The city has awarded the contract to C. SKIDMORE of Parkersburg for paving East St. at $5,084.

VICKSBURG, MISS.—The Board of Supervisors has awarded the contract to GEORGE KING, of Vicksburg, at $10,285, for graveling Jackson Road to National Park, a distance of about two miles.

J. T. CROSS, of Vicksburg, was awarded the contract for laying concrete gutter along the road at 89 cts. per ft.

BROWNSVILLE, TENN.—W. B. TROY, of Camden, has been awarded the contract for graveling about six miles of streets throughout Brownsville, at 45½ cts. per sq. yd.

MEMPHIS, TENN.—The city has awarded contracts for street paving as follows: Madison Ave., three miles, to H. P. STREICHER, Toledo, Ohio, at $139,360, the work including grading, 40,000 yds., at 24 cts., $9,600; concrete foundation, 65,000 yds., at 64 cts., $40,300; asphalt surface, 65,000 yds., at $1.28, $83,200; maintenance, at 5 cts. per yd., $3,250; Patton St., H. W. BRENNAN, at $2,154; Tate Ave., MEMPHIS ASPHALT & PAVING CO., at $3,815, all contractors of Memphis.

Bids for paving Rayner, North Montgomery and South Third Sts. have been rejected. Haskell Weatherford is City Engr.

LEBANON, IND.—Contracts for constructing gravel roads in Eagle Township, bids opened Sept. 8, have been awarded by the County Commissioners to GEORGE T. MILLER and BERT SMITH, of Lebanon, at $4,425 and $5,000, respectively. George E. Adams, Clk.

EVANSVILLE, IND.—STINCHFIELD & REICHERT have been awarded the contract by the Board of Public Works for paving with brick seven or eight alleys at prices ranging from $1.56 to $1.65 per yd. for No. 1 Clinton brick.

CORYDON, IND.—Bids are asked by the Commissioners of Harrison County until Oct. 6, for the construction of a gravel road in Spencer Township and a gravel road in Morgan Township, and until Oct. 7, for the construction of a gravel or macadamized road in Jackson Township.

MUNCIE, IND.—Bids are asked by the Commissioners of Delaware County until Oct. 7 for the construction of a crushed stone macadam road known as the Root road, and a crushed stone-macadam road known as the Smell road in Center Township. Joseph E. Davis is County Audr.

MUNCIE, IND.—Bids are asked by the Commissioners of Delaware County until 10 a. m., Oct. 7, for the construction of the following gravel roads: Langsdon road in Hamilton Township, Payton road in Delaware Township, Moore road in Hamilton Township, and Connell road in Hamilton Township. Joseph E. Davis is County Audr.

MUNCIE, IND.—Bids are asked by the Commissioners of Delaware County until 10 a. m., Oct. 7, for grading and paving with brick the following highways: Hensel road in Center Township; Manor road in Delaware Township; Carmichael road in Center Township, and the Baldwin road in Center Township. Joseph E. Davis is County Audr.

LA FAYETTE, IND.—Bids are asked by the Commisioners Tippecanoe County until 10 a. m., Oct. 7, for the construction of the Miller gravel road in Wabash Township. John P. Foresman is County Audr.

CROWN POINT, IND.—Bids are asked until 10 a. m., Oct. 5, by Commissioners of Lake County for the construction of a gravel road in North Township known as the Ruff road No. 1, and until noon, same date, for a road in North Township, known as Ruff road No. 2. Charles A. Johnson is County Audr.

VINCENNES, IND.—Bids are asked by the Commissioners of Knox County until 2 p. m., Oct. 6, for the construction of two miles and 3,315 ft. of gravel roads in Washington Township, known as the Wample road.

Bids are asked by the Commissioners of Knox County until noon, Oct. 6, for the construction of 1,488 7-10 ft. of gravel road in Vincennes Township. John T. Scott is County Audr.

INDIANAPOLIS, IND.—The Park Board has let a contract to the MOORE-MANSFIELD CONSTRUCTION CO. for the construction of the Fall Creek Boulevard north extension at 29 cts. per yd.

SAGINAW, MICH.—The Board of Public Works has awarded the contract for paving with concrete macadam North Second St. to A. SAGER, at $10,318.

CHICAGO, ILL.—The contract for furnishing and delivering to the city and the First and 18th Wards 1,000 sq. yds. No. 2 granite blocks, bids opened Sept. 12, has been awarded to DOLESE & SHEPARD CO., Woman's Temple, Chicago, Ill., at $1.49 per sq. yd.

Bids are asked until Sept. 26 by John J. Hanberg, Comr. Pub. Wks., for furnishing material and paving with No. 2 granite block a portion of West Kinzie St. John J. Hanberg is Comr. Pub. Wks.

*GENESEO, ILL.—We are officially advised that the McCARTHY IMPROVEMENT CO., of Davenport, Iowa, has been awarded the contract at $29,425 for 14,548 sq. yds. brick pavement, 5,338 cu. yds. excavation, 6,262 lin. ft. concrete curb, ten catch basins, 170 ft. 12-in. sewer pipe, five gutter crossings. Other bidders were: L. A. Pettibone, $30,070; Keys & McNamara, $29,788. Bids were opened on Sept. 16. Clark G. Anderson is Engr., Moline, Ill.

CEDAR RAPIDS, IOWA.—The City Council on Sept. 8 awarded the contract for paving with brick portions of A, C, D, E, Fourth and Washington Aves. and 15th and 16th Sts. and certain alleys to M. FORD at $1.58 per sq. yd.

WICHITA, KAN.—The City Council on Sept. 8 awarded the contract for paving East Douglas Ave. with brick to H. L. MILES at $1.97 per sq. yd.

CANEY, KAN.—J. W. KELSO, of Iola, Kan., has been awarded the contract for 21,780 sq. yds. brick paving, bids opened Sept. 1, at the following prices: 11,000 cu. yds. earth excavation, 33 cts.; 21,780 sq. yds. cinder base, 10 cts.; 21,780 sq. yds. 2-in. course brick, 45 cts.; 21,780 sq. yds. sand cushion, 10 cts.; 21,789 sq. yds. top course brick, 60 cts.; 2,400 ft. header boards, 6 cts.; 21,780 sq. yds. sand fill, 5 cts.; 3,350 lin. ft. concrete curb, 38 cts. Total, $33,394. Other bidders were Grant, Sumner & Conary, Caney, $35,119; Rushmore & Co., Neodesha, Kan., $35,788. Mary E. McMillan is City Clk.

KIRKSVILLE, MO.—Bids are asked until 5 p. m., Sept. 29, by J. C. Carothers, City Clk., for 19,800 sq. yds. vitrified brick pavement and 9,500 ft. combined curb and gutter. Tyler Paine is City Engr.

LITTLE ROCK, ARK.—I. P. SHELBY, of Little Rock, Ark., has been awarded the contract for paving West Tenth St. with brick paving blocks.

BEAUMONT, TEX.—The city has rejected all bids received for constructing about 17,633 yds. of vitrified brick pavement and 7,307 lin. ft. of concrete curbing, and work may be done by day labor, in charge of C. L. Scherer, City Engr.

SPOKANE, WASH.—The Board of Public Works has awarded the contract for furnishing 1,000 barrels of cement for use in the construction of the Mission Ave. bridge, to the UNION FUEL & ICE CO., for "Exshaw" brand at $2.80 per bbl.

ABERDEEN, WASH.—The city has decided to improve H St. and Broadway.

NORTH YAKIMA, WASH.—A. E. GOODWIN has been awarded the contract for graveling 2,800 ft. of the widening of Petit Lane, or what is known as the East Selah Bridge Road.

PASADENA, CAL.—The Council has awarded the contract for improving Madison Ave to the FAIRCHILD-GILMORE-WILTON CO. at the following prices: Asphalt-concrete paving, 13.8 cts. per sq. ft.; cement curb, 27 cts. per lin. ft. Herman Dyer is City Clk.

SALT LAKE CITY, UTAH.—We are officially advised that the Board of Public Works has awarded the contract for grading, curbing and gutering paving extension No. 18 to P. J. MORAN, Salt Lake City, at $14,457. J. W. Mellen, Salt Lake City, bid $15,229 for the work. Bids were opened on Sept. 11.

Bids were received as follows on Sept. 11 for curb and gutter extension No. 7: J. W. Mellen, Salt Lake City, $49,801; P. J. Moran, Salt Lake City, $46,683; S. Birch & Sons Construction Co., Salt Lake City, $43,350; J. D. HANLEY, Salt Lake City, $42,131 (awarded contract). Louis C. Kelsey is City Engr.

NIAGARA FALLS, ONT.—The Queen Victoria Niagara Falls Park Commission has let the contract for Section 4 of the Niagara Boulevard to UPPER & LOBB, of St. Catharines, Ont., at $32,500. The section is 2¾ miles long.

MANUFACTURING PLANTS.

(** denotes that this work is advertised in Engineering News.*)

DANBURY, CONN.—The Peix Hat Co. has filed a certificate of organization with the State Secretary. The capital stock is $10,000. Charles H. Peix, Jr., is Pres.

DUNDEE, N. Y.—Plans are being prepared by the Dundee Brass Mfg. Co. for a 1-story factory, 40 × 200 ft., of reinforced concrete.

OSWEGO, N. Y.—Plans are being prepared by the Ontario Knitting Co. for the construction of a 5-story factory on East Second St. near Oneida St.

BUFFALO, N. Y.—Ballantine & Sons, brewers, Henry W. Baumgarten, Mgr., Ellicott and Carroll Sts., are preparing plans for a bottling house, warehouse and distributing depot on the New York Central Belt Line. Bids will be called for by the manager as soon as plans are completed.

SYRACUSE, N. Y.—The officials of the Syracuse Bridge Co. have decided to increase the company's facilities for handling structural steel by building and equipping a plant in this city, vacating its present plant at Grape and Taylor Sts., and by the construction of a branch plant at some point in New Jersey adjacent to New York City. Plans for the buildings will be prepared at once and construction probably started early in the spring of 1909.

TROY, N. Y.—The Troy Bleachery Co., George Bothamley, Pres., is having plans prepared for a bleachery plant, to consist of a main building and a warehouse. The structure will have two or three stories of brick and concrete, $35,000. Bids will be called for soon.

ROCHESTER, N. Y.—L. Adler Bros Co., 92 St. Paul St., will have plans prepared for a 4-story and basement factory building to cost $300,000.

GENEVA, N. Y.—We are officially advised that the Standard Optical Co., 160 Lyceum St., has awarded the contract for the construction of a 2-story reinforced-concrete lens factory, 150 × 60 ft., to H. S. MOORE, Bellefonte, Pa. Cost of building and equipment, $25,000.

JERSEY CITY, N. J.—The Grey-Rock Glove Co., of this city, has been incorporated with a capital stock of $50,000 to manufacture gloves, white goods, notions, ribbons, textile fabrics, etc. H. F. Burdick, J. T. Hanlon, B. J. Treacy, Jersey City, are the incorporators.

TRENTON, N. J.—Articles of incorporation have been filed by the European Glove Works Co., of Jersey City. The concern is capitalized at $100,000 and is to manufacture kid, chamois, suede and silk gloves. The incorporators are B. Ruocco, G. Marangiolo, B. Solmeri, Jersey City, N. J.

PHILADELPHIA, PA.—The Class & Nachod Brewing Co., Philadelphia, will erect a new brewing plant at 1819-21 North Tenth St. Cost, about $100,000.

PITTSBURG, PA.—Louis O. Brosie is preparing plans for a 2-story manufacturing building for P. H. Lereset. Cost, $10,000.

MEADVILLE, PA.—The Page Boiler Co., South Main St., will enlarge its plant in the near future. C. D. Campbell is Local Mgr.

BEDFORD CITY, VA.—The Bedford Mills Co., to manufacture woolen cloth, will build a 55 × 75 ft. addition, and add new machinery to increase production of woolen cloth, dyed and finished. The mill now has 2,000 spindles, 25 broad looms, etc., and has begun construction of the addition. The company is owned by the Thomas Kent Mfg. Co., Clifton Heights, Pa.

PHOEBUS, VA.—Sayre Bros. are completing arrangements for rebuilding plant recently burned. The new structure will be of concrete, main foundry room 45 × 190 ft. and side floor 19 × 24 ft. on one side only. The machine and pattern shops will be in separate structures and for foundry, aside from small tools, requirements will be confined to hand-power traveling crane of about six tons capacity and 45-ft. span. Corrugated iron roofing will probably be used.

NEWTON, N. C.—The Newton Hosiery Mills, D. J. Carpenter, Proprietor, Newton, N. C., has completed improvements, including the enlargement of warehouse, the addition of a room to the offices, and the installation of several machines for improving output. The mill manufactures seamless cotton hosiery, having 350 knitting machines and accompanying apparatus, dyeing plant, etc.

CHARLOTTE, N. C.—A. Cameron, of Vass, N. C., may build a mill for the manufacture of cotton yarns. It is reported he has awarded contract to T. B. CREEL, of Aberdeen, N. C., for the erection of the main building, 78 × 228 ft., with a capacity of 5,000 spindles.

JACKSON, MISS.—The Benton County Farmers' Union Warehouse Co., with headquarters at Ashland, Miss., has been granted a charter. The capital stock is $10,000 and the purpose of the company is the purchasing, operating and maintaining of gins, compressors and public warehouses for the storage of cotton and produce.

NEW ORLEANS, LA.—Swift & Co., of Chicago, Ill., it is reported, will begin the erection of an 8-story building on Rampart St. to be used for its distributing business in this territory. The building and the machinery, which will be installed, will cost about $500,000 and the building will occupy about 15,000 sq. ft. of ground.

NASHVILLE, TENN.—The Naive-Spillers Co., Gallatin, Tenn., awarded the contract to J. A. G. SLOAN, Nashville, for construction of egg and poultry packing-house, plans for which were prepared by Thompson, Asmus & Norton, Nashville. The building will be 50 × 135 ft., three stories and basement, concrete, stone and brick, steam or hot-water heat, electric elevators, electric lighting, 20 to 40-ton refrigerating plant to be installed.

PARIS, KY.—The Bourbon Marble Works will establish plant, and has awarded contract to PARIS CONSTRUCTION CO., Paris, for construction of buildings. The main building will be 22 × 65 ft., and a 15-ton traveling crane propelled by horse-power will unload marble from cars and 6-ton crane to handle stone while in process of being finished will be installed. The plant will be equipped with air compressor, by which pneumatic tools used in polishing work can be propelled. Construction has begun. W. A. Allen, Owonton, Ky., Mgr.

TOLEDO, OHIO.—J. W. Matz, Arch., Hartford Block, Toledo, has prepared plans for a new brick factory building for the Melling Mfg. Co., located on Jackson St., at the foot of Tenth St. The building will be 240 × 180 ft., and about one-half of the structure will be two stories high. It is estimated that it will cost $25,000. The plans are in the hands of contractors, who are preparing their bids.

CHICAGO, ILL.—Armour & Co. are having plans prepared by R. C. Clark, 7216 Harvard Ave., for a 5-story steel woolhouse with an 8-story tower to replace the building recently destroyed by fire. Estimated cost, $500,000.

JOLIET, ILL.—C. W. Webster, Arch., Cutting Bldg., Joliet, has prepared plans for a 3-story brick office building, 50 × 42 ft., for the Joliet & Southern Traction Co., H. A. Fisher, Mgr., Ottawa and Van Buren Sts., Joliet. Estimated cost, $10,000.

MILWAUKEE, WIS.—H. C. Koch & Son, Archs., 1040 Wells Bldg., have prepared plans for a 6-story structure at 240 Broadway, for the A. Breslauer Co. It will be occupied by S. Fein Bros., wholesale notions and dry goods. Cost, $40,000.

NEENAH, WIS.—The Neenah Paper Co., owned by members of the Kimberly-Clark Co., has let a contract for the construction of a $10,000 addition to the plant operated by the company in this city to the LEONARD CONSTRUCTION CO., of Chicago.

MINNEAPOLIS, MINN.—It is reported that plans are being prepared by the engineers of Armour & Co., of Chicago, Ill., for a packing plant to be erected here. Estimated cost, $5,000,000.

KANSAS CITY, MO.—Ruddy Bros. will construct an ice and refrigerating plant at Summit and Jefferson Sts. Estimated cost, about $300,000.

William Volker, 308 West Eighth St., will erect a building for carriage and rubber tire manufacturing, three stories and basement, 95 × 96 ft., mill construction, steam heat, electric lighting. Cost, $35,000. Plans have been prepared by Shepherd & Farrar, Kansas City. J. T. PATTERSON & CO. have been awarded contract.

ST. LOUIS, MO.—The Heine Safety Boiler Co. has awarded the contract to FRUIN & CONLAN, St. Louis, for the erection of plant, to replace present plant, site of 6½ acres, with frontage of 770 ft. on terminal railway; main building, 140 × 400 ft.; flange shop, 60 × 180 ft.; power-house, 75 × 80 ft. All structures will be of steel, with brick walls and cinder concrete roofs, and the equipment of machinery will be driven by electric motors. Lichter & Jens, Chemical Bldg., St. Louis, are Engrs.-in-Charge.

CONWAY, ARK.—James McMahon, it is reported, is preparing to establish a woolen mill here.

BRIDGEBURG, ONT.—The Pratt & Letchworth Co., of Buffalo, N. Y., it is reported, will begin construction of a factory here immediately. The new building will be of brick and, together with the plant, will cost about $25,000.

ST. BONIFACE, MAN.—Bids will be received by R. E. Ryan, Secy. National Transcontinental R. R., until Oct. 8, for the various shops here, which will be constructed at an estimated cost of $1,500,000.

MISCELLANEOUS CONTRACTS.

(* *denotes that this work is advertised in Engineering News.*)

U. S. RECLAMATION SERVICE.—All news relative to canal projects, etc., will be found under Water Supply—Irrigation.

SUBWAY.—New York, N. Y.—See item under Electric Railways.

IRON CHAIN.—New York, N. Y.—Bids are asked until 3 p. m., Oct. 1, by the Park Board for furnishing and delivering 2,000 ft. of iron chain. Henry Smith is Pres. Bd.

DAM REPAIR.—Carillon, Que.—Bids are asked by J. W. Pugsley, Acting Secy., Dept. Railways and Canals, Ottawa, Ont., until 4 p. m., Sept. 28, for closing the gap in the Carillon dam.

TRACK SCALE.—Fort George Wright, Wash.—Bids are asked by Lieut. Ralph Dickinson, Q. M., U. S. A., until 11 a. m., Oct. 10, for furnishing and installing a track scale on spur of the Great Northern Ry.

GATES.—Brooklyn, N. Y.—Bids will be received until Sept. 30 by Bird S. Coler, Boro. Pres., for furnishing material and constructing gates inclosing wheel pit for the Gowanus flushing tunnel, Borough of Brooklyn.

DRAINS.—Champaign, Ill.—Bids are asked until Sept. 26 by the Commissioners of Drainage District No. 1 of the town of South Homer, for work to be done in sub-district No. 2. Ray & Dobbins, Champaign, are Attys.

*ROCK-CRUSHING PLANT.—Washington, D. C.—Bids are asked until 10.30 a. m., Oct. 19, at the office of Capt. F. C. Bogge, Corps Engrs., U. S. A., Gen. Purchasing Officer, Isthmian Canal Comn., for furnishing a rock-crushing plant.

*DIKE WORK.—Evansville, Ind.—Bid was received on Sept. 18, by Col. Wm. T. Rossell, Corps Engrs., U. S. A., Cincinnati, Ohio, for repair and bank protection to dikes at Evansville from the Ohio River Contract Co., Evansville, Ind., at $4,950.

SPRINKLING SYSTEM.—New York, N. Y.—Bids are asked until noon, Oct. 5, by Allen N. Spooner, Comr. of Docks, for furnishing and installing a dry sprinkling fire protection system for the piers and bulkhead platform extensions on the Chelsea Section, between West 13th and West 22d Sts., North River.

LEVEE WORK.—Memphis, Tenn.—All bids were rejected on Sept. 16 for levee work, 276,000 cu. yds. enlargement work and 769,500 cu. yds. new levee, on account of informality of bids. New bids are asked until Oct. 19. B. J. Covington, 160 Randolph Bldg., Memphis, is Engr.

NAVAL SUPPLIES.—Annapolis, Md.—Bids are asked by E. B. Rogers, Paymaster-General, U. S. N., Bureau of Supplies and Accounts, until 10 a. m., Sept. 29, to furnish at the Naval Academy, Annapolis, Md., a quantity of naval supplies, as follows: Sch. 345, gate valves. Sch. 351, cement, lime, sand.

DREDGING.—Oakland, Cal.—The following are the bids opened on Sept. 10 by the Board of Public Works for dredging the estuary at the foot of Broadway, about 20,000 cu. yds. (a) mud, (b) hard pan: California Reclamation Co., (a) 17⅛ cts., (b) 64¾ cts. per cu. yd.; American Dredging Co., (a) 14½ cts., (b) 59 cts.

DREDGING.—Norfolk, Va.—Bids were received as follows on Sept. 14 by Maj. Joseph E. Kuhn, Corps Engrs., U. S. A., for dredging in Hampton Roads, Va., about 60,000 cu. yds.: L. M. Lewes Dredging Co., Norfolk, 14 3-10 cts.; Coastwise Dredging Co., Norfolk, 16½ cts.; Norfolk Dredging Co., Norfolk, 19¾ cts.

CONDUIT.—Boston, Mass.—Bids were opened on Sept. 9 by Guy C. Emerson, Supt. of Sts., Boston, for the Stony Brook conduit in Rogers Ave., private land, Ruggles and Whittier Sts., part of Section 4, Roxbury, as follows: WM. J. BARRY, $31,197 (awarded contract); Antony Cefulo, $32,616; Coleman Bros., $33,583; Coughlan & Sheils Co., $38,691.

DITCHES.—Morrison, Ill. — Bids were opened on Sept. 12 by the Commissioners of Enterprise Drainage District at the office of McCalmont & Ramsay, Attorneys, Morrison, for constructing ditches, requiring the removal of about 111,048 cu. yds. of material. The contract has been awarded to GEORGE C. BLASDELL, of Fenton, Ill., at 8¼ cts. per cu. yd. John D. Arey is Engr., Sterling, Ill.

FLOATING CRANE.—Bremerton, Wash.—The Secretary of the Navy, Washington, D. C., has decided to award to the WELLMAN-SEAVER-MORGAN CO., 7000 Central Ave., S. E., Cleveland, Ohio, a contract for installing a 100-ton floating crane at the Bremerton Navy Yard, the contract price being $230,000. The crane is to be used principally for lifting guns and turrets off and on ship.

WALL.—Elmira, N. Y.—Bids are asked until 3 p. m., Oct. 7, by James Knox Taylor, Superv. Arch., Treasury Department, Washington, for a lot wall at the U. S. Post-office and Court-House Building at Elmira, N. Y., in accordance with the drawings and specification, copies of which may be had at the office of Supervising Architect, or at the office of the custodian at Elmira, N. Y., at the discretion of the Supervising Architect.

DRAIN.—Rockwell City, Ind.—Bids are asked until noon, Oct. 5, by B. E. Stonebrake, County Audr., for the material and labor for the construction of drain No. 82. Bids will be received for different sizes of tile, also for material and labor complete, for cement or clay tile, separately for furnishing the tile on line of ditch and for digging, laying and filling; also bids for tile f. o. b. at near station and bids for hauling tile to line of ditch.

DAM EXTENSION.—Dayton, Ohio.—Bids are asked until noon, Oct. 2, by the Board of Public Service, Dayton, for the following work on the Riverdale Dam: 50 lin. ft. of Section A''-A'', 470 lin. ft. of Section B''-B'', one dam abutment, one levee abutment, 100 cu. yds. of extra concrete, 100 lin. ft. of extra piles, 1,000 ft. B. M. of extra sheeting, 300 ft. B. M. of extra ties and stringers; also for repairing old dam, 500 lin. ft. of concrete and boulder filling or 500 lin. ft. of concrete cube filling. J. C. Ely is Pres.

*SEAWALL, ETC.—Fort Mason (San Francisco post-office), Cal.—Bids were received by Maj. George McK. Williamson, Q. M., U. S. A., on Aug. 25, for construction at Fort Mason, San Francisco, Cal., of a seawall, crib-wall, transport wharves and sheds for new Army Supply Depot for Quartermaster's Department, U. S. A. Rankin, Kellogg & Crane are Archs., 1012 Walnut St., Philadelphia, Pa. Contract was awarded on plans and specifications prepared by the government to the SAN FRANCISCO BRIDGE CO., 865 Monadnock Bldg., San Francisco, at $1,286,000.

DREDGING.—Los Angeles, Cal.—The ATLANTIC, GULF & PACIFIC CO., Park Row Bldg., New York, and Monadnock Block, San Francisco, has secured the contract, awarded on Sept. 16 by the Los Angeles Harbor Co., for dredging a channel from the present government turning basin to the west side of the west basin and along the frontage of the inner harbor of San Pedro, which the harbor company has leased from the city of Wilmington. The channel will be 100 ft. wide on the bottom, 20 ft. deep and more than a mile long. It calls for 600,000 cu. yds. of excavation. W. J. Arkell is a Dir. of the Los Angeles Harbor Co.

DRAIN.—Trenton, N. J.—Bids are asked by the City Council until 8 p. m., Oct. 6, for the construction of a drain in Paul Ave., from a point about 350 ft. westerly from Brunswick Ave., thence easterly in Paul Ave. to Brunswick Ave., thence in Brunswick Ave. to Sylvester St., thence easterly in Sylvester St. to New York Ave. to a point in the westerly line of lands of the Enterprise Railroad Co., thence across lands of the Enterprise Railroad Co., the Trenton Gas & Electric Co., and the Delaware & Raritan Canal Co. to the westerly end of the storm-water culvert under the Delaware and Raritan Canal, there to connect with said culvert. Harry B. Salter is City Clk.; Abram Swan is City Engr.

LEVEES.—New Orleans, La.—Bids were received on Sept. 15 by the State Board of Engineers for the construction of a number of levees along the Mississippi River and the awards will be recommended to the Governor as follows: Concord levee, new, 35,000 cu. yds., 28.50 cts. per cu. yd., to George H. Conrad; Oak Point levee, new, 28,000 cu. yds., George H. Conrad, 27 cts. per cu. yd.; Riceland to Home Place levee, enlargement and revetment, earthworth, 30,000 cu. yds., revetment 10,000 ft., Patrick Lyons, revetment, $1 per ft., earthwork 24.48 per cu. yd.; Pinaud levee, new, 10,000 cu. yds., S. M. Fucish, Jr., 17.20 cts. per cu. yd.; Cannon to Nestor levee, enlargement and revetment, earthwork 15,000 cu. yds., revetment 7,000 ft., S. M. Fucish, Jr., revetment 79 cts. per ft., earthwork 23⅓ cts. per cu. yd.

LEVEE.—Memphis, Tenn.—The Mississippi Board of Levee Commissioners have awarded the following contracts for levee construction: ROACH & STANSELL, Dennis Landing levee, 95,000 yds. at 28 cts.; Stokes place, 42,000 yds. at 28 cts.; Buck Ridge, 90,000 yds. at 26 cts.; Huntington Sh[illegible] Line, 80,000 yds. at 28 cts.; Albemarle, [illegible],000 yds. at 29 cts.; Chotard to Brunswick, [illegible]2,000 yds. at 24 cts.; VAUGHAN & S[illegible], Gunnison levee, 42,000 yds. at 21.98 c[illegible] Warfield, 80,000 yds. at 14.94 cts.; Warf[illegible] riverside enlargement, 46,000 yds. at 1[illegible] cts.; below Fitler's, 90,000 cu. yds.; [illegible]NARD & CO., Jenkins levee, 80,000 cu. [illegible] at 29.90; Lagrange, 35,000 yds. at 23.50; Cottonwood to Arcadia, 36,000 yds. at 18.9[illegible] above Chotard, 60,000 yds. at 24.40; [illegible]ORRISON BROS., Stack Island, 37,000 y[illegible] at 16.90. Contractors are all of Memphis.

VESSELS.—Washington, D. C.—The Secretary of the Navy has awarded contracts as follows for the construction of [illegible]n torpedo boat destroyers for which bids were opened Sept. 1: FORE RIVER SHIPBUILDING CO., Quincy, Mass., two vessels at $610,000 each; NEW YORK SHIPBUILDING CO., Camden, N. J., two at $665,000 each; NEWPORT NEWS SHIPBUILDING & DRY DOCK CO., Newport News, Va., two at $620,600 each; BATH IRON WORKS, Bath, Me., two at $644,000 each; CRAMP & SONS SHIP & ENGINE BUILDING CO., Philadelphia, two at $664,000 each. The Fore River Co. will construct boats on their own plans and specifications with a sped of 29½ knots. The Cramp Co. boats on their own plans and specifications with a speed of 30 knots. The other six boats will be on the Government plans and specifications, with a speed of 29½ knots and a displacement of 742 tons.

DITCH.—Le Roy, Ill.—H. S. WALTER, of Cisco, Ill., has been awarded the contract by the Commissioners of Fairview Drainage District, bids opened Sept. 16 for furnishing about 20,000 ft. of tile as well as the excavation of about five miles of ditch, hauling, covering, etc., at $9,100. The contractor will furnish 3,500 ft. of 24-in. salt-glazed or vitrified tile, all the rest to be of shale. The other bidders were as follows: Chicago Fire Brick Co., Chicago, Ill., for the tile alone, $5,846; National Drain Tile Co., Terre Haute, Ind., to complete the entire system according to specifications, $10,500; Indiana Drain Tile Co., entire system, $9,150; furnish tile alone, $5,500; J. W. Egan, Amboy, Ill., complete entire system, $11,095; furnish vitrified tile for entire work, $6,530; hauling, $350; excavating and laying, $3,940; refilling, $275; J. W. Spahr, Springfield, Ill., excavating and laying, $3,250. A. H. Bell, County Surv., McLean County, is Engr., Bloomington, Ill.

LUMBER.—Washington, D. C.—Bids were received as follows on Sept. 9 at the office of the Corps of Engineers, Washington, D. C., for furnishing (a) 113,280 ft. B. M. of lumber, and (b) 20,034 lin. ft. of piling: G. S. Briggs & Co., Norfolk, Va., (a) $18 per M., (b) 8 cts. per ft; Old Dominion Paper Co., Norfolk, (a) $27.50; Crockett Lumber & Pile Co., Norfolk, (b) 7.75 cts.; Southampton Lumber Co., Norfolk, (a) $20.15, (b) 9 cts.; John H. Traut, Jr., (b) 8.5 cts., (a) $21; Carter Clark, Washington, (a) $18.30; Andrew Miller, Baltimore, Md., (a) $22.75, (b) 5⅝ cts.; Geo. R. Johnson, Baltimore, (b) 6⅝ cts.; William D. Gill & Sons, Baltimore, (a) $19.95; Culpeper & Co., Baltimore, (b) 5.4 cts.; J. A. Rennolds & Bro., New York, (b) 6.5 cts.; Silas W. Eubank, Kilmarnock, Va., (b) 7.75 cts.; Denmead Bros., West Point, Va., (a) $18.75; G. Elias & Bro., Buffalo, (a) $24.75; Building & Lumber Co., Greenville, N. C., (a) $20.75; Morgan Flint, West Point, Va., (a) $21.50, (b) 9.5 cts.

*BARGE CANAL.—Albany, N. Y.—No bids were received by F. C. Stevens, Supt. Public Works, on Sept. 9 for Contract No. 20, Erie Canal, Sections 2, 3 and 4, for dredging a channel in the Mohawk River and performing work incidental thereto between Rexford Flats and Little Falls. Length, 58.7 miles. Engineer's estimate, $4,173,900. This is the second time bids have been called for on Contract No. 20 in its present form without any bid being received. Bids were asked on the contract in its original form about a year ago without result, and at that time the State authorities believed contractors refrained from bidding for the reason that the amount of work was too small to warrant the large plant which would be required. Thereupon, work adjoining this contract, which had been provided for in separate contracts, was included, and the work readvertised. No bids having been received on that call, the specifications, which provided that the contractor would be held responsible for maintaining the channel for the full distance until the completion of the work, were modified so that the work was divided into five sections, the contractor to be held responsible only for each section until it was completed and accepted. This plan has not brought forth any bids. What course will now be pursued with reference to the contract has not as yet been decided upon. There are 8,420,000 cu. yds. of excavation called for in the contract at an estimate price of 48½ cts. per yd.

Two bids were received by F. C. Stevens, Supt. Public Works, on Sept. 9 for Contract No. 66, Erie Canal, Section 10, for the improvement of the Erie Canal from the west end of Contract No. 64 to about 600 ft. east of the Lockport Locks. Length, 6.55 miles. Estimated cost, $751,000. Bidders were: E. M. Graves, of Cleveland, Ohio, $791,191; the EMPIRE ENGINEERING CORPORATION, 60 Wall St., New York, $750,685. Itemized bids were given last week under Contract Prices.

U. S. POSSESSIONS AND CUBA.

DREDGES.—Panama.—Bids are asked by Capt. F. C. Boggs, Corps Engrs, U. S. A., Gen. Purchasing Officer, Isthmian Canal Comn., until 10.30 a. m., Oct. 16, for furnishing two clam-shell dredging machines with boilers.

MACHINE SUPPLIES, ETC.—Panama.—Bids will soon be asked by the Isthmian Canal Commission for furnishing 10,600 lbs. cone head rivets, 7,000 lbs. countersunk head rivets, 5,500 lbs. wrought stove bolts, 33,400 carriage bolts, 106,993 square head machine bolts, 1,024 hexagon head machine bolts, 5,000 countersunk machine bolts, 2,700 drift bolts, 100 key bolts, 500 tire bolts, 10,000 lbs.

w.-i. spikes, 22,000 c.-i. washers, 22,000 black iron lag screws, six iron levels, one socket wrench, six sheets brass, 200 lbs. Tripoli, 50 plate glass mirrors, frame to be of seasoned oak, size 14 x 24 in.; 40 Mission oak rocking chairs, 24 cocoa mats, 18 x 30 in.; 10 typewriter chairs, 20 sheets hot rolled copper and 120 sheets cold rolled copper.

DUMP CARS.—Panama.—Bids were received as follows Sept. 21, at the office of the Isthmian Canal Commission, Washington, D. C., for furnishing 200 12-yd. double dump cars for use on the Panama Canal: American Car & Foundry Co., 165 Broadway, New York, $191,800, 130 days; Baldwin Locomotive Works, 500 North Broad St., Philadelphia, $307,000, 120 days; Arthur Koppel Co., 66 Broad St., New York, $180,000, 160 days; William J. Oliver Mfg. Co., Knoxville, Tenn., $217,000, 130 days; Russell Wheel & Foundry Co., Detroit, Mich., $193,400, 125 days; Standard Steel Car Co., 170 Broadway, New York, $197,000, 150 days shipment; Kilbourn & Jacobs Mfg. Co., Columbus, Ohio, $203,000, 140 days; Western Wheeled Scraper Co., Aurora, Ill., $257,000, $297,000, $189,600, 120 days.

The Isthmian Canal Commission, Washington, D. C., has awarded contract for furnishing 50 6-yard all metal double dump cars to the WILLIAM J. OLIVER MFG CO., Knoxville, Tenn., at $29,750.

CONTRACT PRICES.

[Where * precedes item under Contract Prices the work was advertised in Engineering News.]

CONCRETE DAM.—Cincinnati, Ohio.—Bids were received as follows, in detail, by Col. Wm. T. Rossell, Corps Engrs., U. S. A., on Sept. 10, for constructing dam of concrete, etc., at head of Browns Island, Ohio River: Bidders were: (A) Advance Sand & Construction Co., Pittsburg, Pa.; (B) Pennsylvania Contracting Co., Pittsburg; (C) The H. E. Talbott Co., Dayton, Ohio; (D) J. C. Thomas, Louisa, Ky.:

	(A)	(B)	(C)	(D)
165 cu. yds. excavation, ledge rock	$3.50	$4.50	$3.00	$1.00
5,400 cu. yds. excavation, loose material	.90	.75	1.00	1.00
901 lin. ft. anchor bolt holes	.50	.95	1.00	1.00
110 piles	13.00	14.00	25.00	16.00
8,600 lbs. iron tie rods, anchor bolts, etc	.07	.06	.05	.08
2,000 cu. yds. stone, 9—18 cu. ft. each	3.50	4.00	5.50	4.00
2,100 cu. yds. stone, ¾—3 cu. ft. each	4.00	3.50	5.50	4.00
Earth filling (if required)	.70	.95	.50	1.00
2,625 cu. yds. concrete	8.25	10.40	10.00	9.50
40 bbls. extra cement	2.50	2.50	2.00	2.50
Total	$44,671	$49,684	$58,045	$49,540

SEWER SYSTEM.—Point Pleasant, N. J.—Bids were received on Sept. 3 by the Mayor and Borough Council for constructing a system of sewers and drains, as follows: (A) FIELD, BARKER & UNDERWOOD, Arcade Bldg., Philadelphia (awarded contract); (B) Atlantic Construction & Supply Co., Bartlett Bldg., Atlantic City, N. J.; (C) James Mannix, 23 Gilchrist St., Jersey City, N. J.; (D) Harrison Construction Co., 837 Broad St., Newark, N. J.; (E) Thos. H. Riddle, 25 Remsen St., New Brunswick, N. J.; (F) William John Smith, Spring Lake, N. J.; (G) D'Amato & Stepanelli, 74 Summer Ave., Newark, N. J. Pugh & Hubbard, Witherspoon Bldg., Philadelphia, are Engrs. Itemized prices for this work were as follows:

	(A)	(B)	(C)	(D)	(E)	(F)	(G)
1 600′ iron ocean outlet and anchor	$2,350.00	$2,886.00	$2,094.00	$2,500.00	$2,500.00	$2,100.00	$1,500.00
1 emergency outlet and valve	85.00	60.00	85.00	50.00	140.00	75.00	70.00
Piling, price per pile	15.00	1.50	22.50	10.00	10.00	10.00	5.00
4,890 ft. 12″ T. C. sewer, including "Y's"	.80	1.15	.74	1.05	.80	1.00	2.25
4,100 ft. 10″ T. C. sewer, including "Y's"	.60	.65	.64	.90	.70	.90	1.20
3,250 ft. 8″ T. C. sewer, including "Y's"	.49	.40½	.55	.60	.65	.75	.95
7,755 ft. 6″ T. C. sewer, including "Y's"	.40	.31	.54	.45	.60	.50	.60
705 ft. 12″ C. I. sewer, including "Y's"	1.61	1.46	2.63	1.50	2.50	1.50	1.70
1,355 ft. 10″ C. I. sewer, including "Y's"	1.29	1.21	2.14	1.30	1.40	1.30	1.50
100 ft. 8″ C. I. sewer, including "Y's"	1.23	.90	1.75	1.00	1.45	1.00	1.20
550 ft. 6″ C. I. sewer, including "Y's"	.80	.62	1.07	.70	1.25	.75	.96
22 manholes	50.00	43.00	35.00	35.00	35.00	40.00	35.00
3 manholes with flushing gate	20.00	38.00	50.00	45.00	30.00	45.00	40.00
21 inspection holes	6.50	15.00	7.00	8.00	4.00	7.00	10.00
4 flush tanks	80.00	70.00	100.00	75.00	60.00	75.00	70.00
Extra water pipe for tanks, per ft	.25	.50	.15	.25	.10	.20	.25
1 tidal tank	1,300.00	1,497.00	1,150.00	1,200.00	1,800.00	3,000.00	1,100.00
Tidal tank alternate roof	1,250.00	$1,557.00	$1,000.00	1,125.00	2,000.00	3,000.00	1,000.00
Total	$19,864	$21,207	$22,531	$22,691	$23,663	$24,863	$31,592
Working days to complete	80	90	120	75	No time given.	60	125

*ROLLING LIFT BRIDGE.—Chicago, Ill.—Bids were received as follows by the Sanitary District of Chicago on Sept. 2 for the following work: (Section 1) for supplying all materials and labor, excepting for electrical work and interlocking, necessary for the equipment of the 8-track bridge for the Pittsburg, Cincinnati, Chicago & St. Louis Ry. Co., the Chicago Terminal Transfer R. R. Co. and the Chicago Junction Ry. Co., crossing the main drainage channel; (Section 2) for the removal of the existing channel spans of this bridge over the main drainage channel and for the construction of new single-leaf channel spans and supplying the necessary machinery and electrical equipment therefor: (A) Modern Steel Structural Co., Waukesha, Wis.; (B) Kettler-Elliott Erection Co., Chicago; (C) Strobel Steel Construction Co., Chicago; (D) John J. Fanning & Co., Chicago; (E) Pennsylvania Steel Co., Steelton, Pa.; (F) Chicago Bridge & Iron Works, Chicago; (G) Riter-Conley Mfg. Co., Pittsburg; (H) Roemheld Construction Co., Chicago; (I) King Bridge Co., Cleveland, Ohio:

Section 1:

	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)
4 cylinder piers (lump sum)	$20,000.00	$16,000.00	$14,300.00	$10,480.00	$20,000.00	$18,000.00	$15,750.00	$16,000.00	$18,000.00
1,000 cu. ft. cylinder piers extending below 40	2.00	1.25	.60	1.10	4.90	1.50	1.65	.65	1.60
7,440,000 lbs. structural steel except in cylinder piers	.0388	.0418	.0466	.046	.043	.04	.0401	.042	.0448
40,000 lbs. machinery steel	.1454	.066	.14	.0748	.115	.09	.0701	.13	.12
140,000 lbs. machinery steel castings	.0854	.098	.09	.1168	.115	.09	.1037	.073	.066
88,000 lbs. track plate steel castings	.0714	.087	.06	.1058	.085	.09	.0922	.068	.06
220,000 lbs. steel castings	.0498	.055	.06	.0688	.057	.055	.0581	.047	.06
4,000 lbs. machinery iron castings	.1778	.054	.16	.0638	.115	.07	.0586	.16	.065
4,000 lbs. iron castings	.1238	.044	.11	.0536	.115	.04	.0481	.025	.065
1,000 lbs. bronze	.3758	.35	.50	.38	.50	.40	.3695	.50	.51
400,000 lbs. iron counterweight	.0114	.018	.015	.0115	.011	.01⅓	.0175	.01	.012
2,100 cu. yds. concrete counterwght.	8.00	8.60	7.00	4.00	8.00	9.00	7.87	10.00	8.00
90 M. ft. timber and lumber	37.25	46.00	60.00	25.00	50.00	45.00	48.30	47.00	48.00
440 cu. yds. Portland cement concrete except in cylinder piers	12.00	8.60	8.00	10.00	8.00	12.00	8.40	12.00	9.00
2,000 cu. ft. Portland cement mortar of 1 to 2½ mixture	.55	.60	.40	.75	.45	.60	.47	.50	.50
100 cu. ft. Portland cement mortar of 1 to 1½ mixture	.85	.70	.60	1.00	.70	.90	.74	.50	.70
60,00 lbs. reinforcing bars	.0279	.035	.03	.04	.044	.03	.035	.03	.0295
Two operators' houses (lump sum)	2,200.00	2,000.00	2,000.00	2,500.00	2,000.00	2,000.00	2,100.00	1,500.00	2,000.00
Entire electrical equipment (lump sum)	19,000.00	20,000.00	20,000.00	22,000.00	18,500.00	21,500.00	20,000.00	15,000.00	18,985.00
Wrecking and removal of old material (lump sum)	22,800.00	19,500.00	8,500.00	11,460.00	19,800.00	17,600.00	20,475.00	20,000.00	19,300.00
For old material (lump sum)	5,812.00	14,300.00	8,500.00	16,560.00	10,000.00	17,000.00	14,500.00	10,000.00	12,000.00
Total	$424,117	$443,154	$462,644	$458,070	$460,090	$430,647	$432,017	$435,974	$459,467
Total, with amount deducted for old material	$418,305	$428,854	$454,144	$441,510	$450,090	$413,647	$417,517	$425,974	$447,467

Section 2:

	(A)	(B)	(C)	(D)	(E)
Complete equipment of entire 8-track bridge (lump sum)	$349,834.00	$385,000.00	$399,000.00	$407,675.00	$449,700.00
50,000 lbs. extra structural steel	.0475	.042	.06	.049	.06
20,000 lbs. extra machinery steel	.09	.066	.12	.07	.115
5,000 lbs. extra steel castings	.10	.098	.12	.11	.115
5,000 lbs. extra iron castings	.20	.055	.10	.0675	.115
500 lbs. extra bronze	.40	.351	.70	.40	.50
50,000 lbs. extra counterweight block castings	.015	.021	.02	.014	.025
70,000 ft. B. M. extra timber and lumber, put in place	40.00	46.00	50.00	35.00	50.00
50 cu. yds. extra Portland cement concrete	11.00	9.50	10.00	10.00	12.00
Total	$358,189	$392,917	$408,690	$415,002	$459,680

CIVIL SERVICE EXAMINATIONS.

FOREST ASSISTANT.—Philippines.—The U. S. Civil Service Commission announces an examination on Oct. 21-22, to secure eligibles from which to make certification to fill three vacancies in the position of Forest Assistant, in the Philippine Service, at an entrance salary of $1,400 a year each, and vacancies requiring similar qualifications as they may occur in that service. Age limit, 18 to 40 years. Application Forms 2 and 375.

ASSISTANT DESIGNER.—Washington, D. C.—An examination will be held by the U. S. Civil Service Commission on Oct. 21 to secure eligibles from which to make certification to fill a vacancy in the position of Assistant Designer, at $1,200 per annum, in the Bureau of Engraving and Printing, and vacancies requiring similar qualifications as they may occur in that bureau. Applicants will be required to furnish with their applications samples of work done by themselves, with evidence to prove that the samples submitted are their own workmanship. Each applicant will also be required to furnish, on a form prescribed by the Commission, evidence showing what experience he has had and when and where it was acquired. Age limit, 20 years. Application Form 1093 and special form. No application will be accepted unless properly executed and filed in complete form, with the material required, with the Commission at Washington prior to the hour of closing business on Oct. 21.

MECHANICAL DRAFTSMAN. — Washington, D. C.—On Oct. 21, 22, 23 the U. S. Civil Service Commission will hold an examination to secure eligibles from which to make certification to fill vacancies as they may occur in the position of skilled Mechanical Draftsman in the ordnance establishments named below, at an entrance salary of $1,000 to $1,200 a year, according to the ratings made the eligibles in the examination: Augusta Arsenal, Augusta, Ga.; Benicia Arsenal, Benicia, Cal.; Frankford Arsenal, Frankford Station, Philadelphia, Pa.; Manila Ordnance Depot, Manila, P. I.; New York Arsenal, Governors Island, New York Harbor, N. Y.; Picatinny Arsenal, Dover, N. J.; Rock Island Arsenal, Rock Island, Ill.; San Antonio Arsenal, San Antonio, Tex.; Sandy Hook Proving Ground, Sandy Hook Proving Ground, Fort Hancock, N. J.; Springfield Armory, Springfield, Mass.; Watertown Arsenal, Watertown, Mass.; Watervliet Arsenal, Watervliet, N. Y. The number of draftsman employed in the Ordnance Department at Large depends upon the work authorized under the appropriations for this Department, and the vacancies which it will be necessary to fill when the register of eligibles is established as a result of this examination can not at present be definitely stated. Age limit, 18 years. Application Form 1312. No application will be accepted unless properly executed and filed with the Commission at Washington prior to the hour of closing business on Oct. 10.

HIGHWAY OR RAILWAY ENGINEER, IRRIGATION ENGINEER.—Philippines. — The U. S. Civil Service Commission announces that applications will be received for consideration in connection with filling vacancies in the following-named engineering positions in the Philippine Service: Eight civil engineers with high-grade experience in highway or railway location and construction, or both; salaries, $2,000 to $2,500 a year, according to qualifications. For these positions not less than five years' experience in responsible positions is requisite (four years' if the applicant is a technical school graduate), of which at least two years must have been in the class of work above specified. Five civil engineers with good experience in irrigation or reclamation engineering; salaries, not over $2,000 a year. For these positions not less than five years' experience in responsible positions is requisite (four years' if the applicant is a technical school graduate), of which at least two years must have been in the class of work above specified. No education examination will be given for these positions, but applicants will be required to file forms setting forth their general and technical education, their general experience and their experience in the special line of work called for, and a technical description of some important engineering work upon which they have been employed. Age limit, 18 to 40 years. Application Forms 2 and 375. No application will be accepted unless properly executed and filed in complete form, with the material required, with the Commission at Washington prior to the hour of closing business on Oct. 19. In applying for this examination the exact title of the position sought as indicated at the head of this announcement should be used in the application.

Readers' Wants

If you are in the market for material, equipment or supplies, and fail to find it in our advertising pages, send us full particulars, and we will gladly put you in touch with the right parties.

FLAT CARS.—Philadelphia, Pa.—A. V. Kaiser & Co., Drexel Bldg., Philadelphia, write us that they are in the market to purchase 200 second-hand 40-ton capacity flat cars.

PAPER WATER PIPE.—Philadelphia, Pa.—C. J. Young, 3712 North 15th St., Philadelphia, Pa., advises us that he wishes to learn the names of manufacturers of paper water pipe.

METAL AND CONCRETE PILES.—Salt Lake City, Utah.—We are advised that Charles F. Porter, 627 Dooley Block, wants prices and information regarding sheet metal piles and reinforced-concrete piles.

PREPAYMENT WATER METERS.— Providence, R. I.—G. E. Weeden, 605 Branch Ave., Providence, R. I., advises us that he desires to communicate with manufacturers of prepayment water meters similar to the prepayment gas meters in use at present in various localities.

CONTRACTORS' EQUIPMENT. — Columbus, Ohio.—We are advised by Schillinger Bros. Co., Columbus, Ohio, that they are in the market for the following: One 30-HP. 3-drum and boom swinger attachment engine with boiler, one clam shell or orange peel bucket, one 30-HP. engine and cableway complete for 800-ft. span, one guy derrick with 70-ft. boom, sand stone, cement, slag cement, structural steel and reinforcing bars.

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INDUSTRIAL NOTES.

THE PLANT of the Kosmos Portland Cement Co., of Louisville, Ky., located at Kosmosdale, Ky., was damaged by fire to the extent of $2,000,000 loss on Sept. 11.

JOSEPH G. POLLARD, 141 Raymond St., Brooklyn, N. Y., reports the receipt of an order from the Bureau of Public Works, Department of Interior, Porto Rico, for 110 dozen pick handles and 2¼ tons of crow bars.

UNDER DATE of Sept. 10 a notice appeared in this column to the effect that the Ficklen-Baker Construction Co. had changed its name to the Baker Construction Co. This item was incorrect as the new firm is known as the Baker Contracting Co.

THE ENGINE SERVICE CO., Inc., electrical engineers and purchasing representatives, 90 West St., New York, announce that it has established offices in the West St. Bldg. for the transaction of a general electrical engineering and contracting business, in the equipment of industrial, power and other plants. Gerard B. Werner, E. E., is Pres.; Robert Josephi, E. E., Secy. and Treas.

THE BETTENDORF AXLE CO., of Davenport, Iowa, has now over half a million bolsters in service and the Bettendorf Ideal car truck, with the one-piece frame, is being adopted by many of the railway systems of the country. At the present time an order for 2,500 steel underframes for the Chicago, Milwaukee & St. Paul Ry. is being turned out at the rate of about 25 per day.

A CEMENT AND CEMENT PRODUCTS EXHIBITION is to be held at the Coliseum, Chicago, Feb. 18 to 24, 1909. This is the second annual exhibition held by the Cement Products Exhibition Co., which is composed of representatives of several cement companies, and has its offices at 1430 Commercial Bank Bldg., Chicago. Mr. Edward M. Hagar is President; C. H. Wood, Secretary and Treasurer.

THE McMYLER MFG. CO. Cleveland, Ohio, closed a contract for a coal handling plant to be located in Philadelphia. This plant contains a machine to take a boat out of the water, elevate it about 60 ft. in the air, and turn it upside down to discharge the coal. The coal after being discharged may be delivered into other vessels or conveyed into storage. Means is also provided for taking coal out of storage and delivering it into vessels. Provision is made for screening the coal and handling it with minimum breakage.

ANNOUNCEMENT IS MADE by the National Battery Co., of Buffalo, that the receivership under which this company has been operating since last February was terminated on Aug. 19. All claims against the National Battery Co. have been settled and the entire property has been restored to the stockholders. It is stated that full control of the reorganized company has been secured by The Cutler-Hammer Mfg. Co., of Milwaukee, makers of battery charging rheostats and other electrical controlling devices. The plant of the National Battery Co. will remain at Buffalo, but the business will be conducted under new management and with ample capital.

THE GENERAL ELECTRIC CO., of Schenectady, N. Y., announces that the Famatina Development Corporation, which is interested in the development of copper mines near Chilecito, Argentine, is having General Electric apparatus installed. Also, the Santos Dock Co., Santos, through whose docks a quantity of the coffee exported from Brazil, passes, has recently received from the General Electric Co. complete generating station equipment, 5 revolving field 3,000-KW., 2,300-volt, 3-phase, 60-cycle, alternating current generators, 350-KW. exciters, 15 1,000-KW. step-up transformers, transforming generator voltage to 44,000 volts, with complete switchboard of most modern construction. Among the orders recently listed by the General Electric Co. is one for the Kobe Electric Railway Co. of Kobe, Japan, a seaport town, of some 200,000 inhabitants. This order is a comprehensive one and includes: Two 500-KW., 25-cycle, engine-type, 3-phase alternators; two 20-KW., 125-volt marine sets to be used as exciters; one 40-KW. motor generator set intended for use as a spare exciter; four 40-KW. transformers; 100 G. E. 78 railway motors, complete, and a complete switchboard equipment for the power-house.

WE ARE IN RECEIPT of a letter from William E. Peck & Co., Agents, 116 Broad St., New York, portions of which we quote as follows:

"In the latter part of July, 1908, the President of Chile signed a decree appointing Messrs. Morrison & Co., of Valparaiso, Chile (a well-known firm of importers and engineers), sole suppliers to the Chilian Navy for a period of five years, the contract covering practically every item of supplies of all kinds that will be called for by the Chilian Navy.

"Messrs. Morrison & Co. have expressed their intention of giving American manufacturers every opportunity to figure upon all of their requirements in this connection. We would ask you to suggest that manufacturers and general suppliers among your readers get in touch with this large and well-known Chilian firm, with the idea of laying before them the articles likely to be of interest in connection with the above contract.

"As agents for Messrs. Morrison & Co. in this country, we will be very pleased to furnish any of your readers, with any further information, and will also be glad to convey to Messrs. Morrison & Co. any and all particulars which manufacturers may wish to bring before them."

TRADE PUBLICATIONS.

(* *denotes that this work is advertised in Engineering News.*)

SHORT STORIES ABOUT STEEL.—The Park Drop Forge Co., Cleveland, O. Paper; 4½ × 6¾ ins.; pp. 6; illustrated.

Booklet No. 4 of a series issued under this title contains an interesting account of the discovery of the process for making crucible steel, and a simple description of the carbon transformations which occur in steel subjected to various heat treatments. The illustrations show specimens of drop forgings.

TELEPHONE WIRE.—American Steel & Wire Co., Rookery Bldg., Chicago. Paper; 9 x 12 ins.; pp. 7; illustrated.

In the August issue of the serial published under the title of "W. & M. Telephone Wire News" appears a practical article on stringing, splicing and tying telephone line wires, including a table giving the amount of sag to be allowed in stringing wire at different degrees of temperature.

BRICK AND STONE DRILL.—Joseph G. Pollard, 141 Raymond St., Brooklyn, N. Y. Paper; 3½ × 6¼ ins.; pp. 2; illustrated.

This leaflet describes a steel drill head which may be screwed onto the threaded end of a piece of gas pipe. The pipe then serves as a handle for the drill. The manufacturer claims that this drill will make a clean, smooth hole in brick or concrete without chipping at the edges. It is made for holes from 9/16 to 3¼ ins. in diameter.

FEED WATER ANALYSES.—The Sarco Fuel Saving & Engineering Co., West Street Building, New York City. Paper; 8¾ × 11 ins. pp. 1; illustrated.

This circular describes the operation and purpose of the Sarco feed water analyzer. It is claimed that this analyser "serves to determine at any time, and in a few moments, the exact quantity of soda necessary from day to day to keep a boiler free from scale."

HART CONVERTIBLE CARS.—Rodger Ballast Car Co., Railway Exchange, Chicago. Paper; 3¼ × 6¼ ins.; pp. 51; illustrated.

This booklet contains brief descriptions of convertible freight cars with reproductions of photographs and drawings of cars already built for a number of different railways. Flat, gondola, box and stock cars are shown with convertible floors which, it is claimed, may be transformed in 20 minutes from flat bottom to hopper bottom for dumping.

AUTOMATIC SEWAGE APPLIANCES.—Merritt & Co., Philadelphia, Pa. Paper; 6¾ × 10 ins.; illustrated.

Several reproductions of blue-prints show the various types of "Aerlock" automatic apparatus for the control of sewage and other liquids. A pamphlet entitled "Progress in Sewage Treatment" contains an abstract of a paper on the sewage tests at Columbus, O., and a reference list of reports and papers pertaining to sewage treatment.

CONDENSING APPARATUS.—Alberger Condenser Co., 95 Liberty St., New York. Catalog No. 9. Paper; 6 × 9 ins.; pp. 95; illustrated.

In this catalog are illustrated and explained the Alberger barometric and centrifugal condensers. Vacuum and circulating pumps, cooling towers and feed water heaters are described. A convenient table of temperatures and absolute pressures in inches of mercury from 0.2 ins. to 4.1 ins. is given.

PORTABLE HEATERS AND MELTING FURNACES.—Rockwell Furnace Co., New York City. Two pamphlets. Paper; 9 × 12 ins.; pp. 8 and 32; both illustrated.

Descriptions are given of the various uses of portable heaters, and reproductions of photographs show them in operation on diffent classes of work. General and sectional views of melting furnaces are shown with tables of general specifications and dimensions. Blowers and other furnace accessories are described.

WATER-METER BOXES.—H. W. Clark, 1518 Broadway, Mattoon, Ill. Paper; 3½ × 6 ins.; pp. 14; illustrated.

This meter-enclosing box is designed to protect the meter from severe weather and to allow it to be installed outside the building supplied with water, that the greatest ease of taking readings may be obtained. The boxes have a cast-iron base, an earthenware or spiral-riveted, iron body and a cast-iron cover. Sheet-iron forms also may be obtained for making up concrete bodies.

STEAM AND WATER SPECIALTIES.—Golden-Anderson Valve Specialty Co., Fulton Bldg., Pittsburg, Pa. Catalog No. 11. Paper; 5½ × 8½ ins.; pp. 64; illustrated.

This pamphlet contains descriptions of a variety of valve specialties for boilers, standpipes and water service, including extra heavy cushioned and globe valves for 350 lbs. working pressure. The Golden tilting steam trap is described as having no floats, valves nor buckets inside of trap. It is made for pressures up to 275 lbs.

WHITE PORTLAND CEMENT.—Berkshire White Portland Cement Co.; Vulcanite Portland Cement Co., Flatiron Bldg., New York City, Sales Agent. 6 × 9 ins.; pp. 20; illustrated.

A white cement which combines the purity of color of plaster of paris with the strength of Portland cement, has been looked for for many years. Of late several mixtures have been put on the market, among which is the one described in the above noted pamphlet; which also contains directions as to its use in decorative work of many kinds.

REINFORCED CONCRETE FLOOR SYSTEM.—Leibu Hermann, 11 Broadway, New York City. 7 × 10 ins.; pp. 8; illustrated.

Mr. Hermann describes in this pamphlet a floor system of reinforced concrete, patented and erected by himself. It is a rod reinforced system the peculiarity of which is in the position of the bars.

ELECTRIC FURNACE.—C. W. Leavitt & Co., 220 Broadway, New York City. Paper; 5½ × 8½ ins.; pp. 19; illustrated.

This booklet contains a description of the operation and advantages of the Paul Girod electric furnace. Itemized data on the cost of melting a ton of steel in this type of furnace, and on the cost of installation, are given. The illustrations consist of sectional views of two and eight-ton furnaces.

ELECTRICAL APPARATUS.—Fort Wayne Electric Works, Fort Wayne, Ind. Bulletins 1,107 and 1,108. Paper; 8 × 10½ ins.; pp. 6 and 4; illustrated.

The first of these bulletins describes the equipment making up a standard line of alternating-current single-phase switchboard panels. The second bulletin is largely a description of the mechanical features of a line of multi-phase, revolving-field belted system of reinforced-concrete flooring devised by the American Steel & Wire Co. As a result of the test the system has been accepted by the building departments of New York and other large cities.

REINFORCED CONCRETE CONSTRUCTION.—Expanded Metal & Corrugated Bar Co., Frisco Bldg., St. Louis. "Designing Methods — Reinforced-Concrete Construction." Vol. 1, Nos. 1-3, May-July, 1908. 6 × 8½ ins.; illustrated.

This company is getting out a monthly bulletin on the design of reinforced concrete which approaches in value most of the text books on the subject. The three so far issued are entitled respectively: (1) Buildings, General Principles of Design; (2) Buildings; Detailed Design of Typical Building; (3) Bridges and Culverts for Highway Traffic; Flat Slab and Girder Type. The bulletins are published in uniform style and so arranged that they may be bound together and those issued are well worth preserving.

For other Proposal Advertisements see pages 43, 44, 45, 46, 51, of Advertisements and Construction News page 114.

SANITARY SEWERS AND SEWAGE DISPOSAL PLANT.

Rye, N. Y.

Sealed proposals will be received by the Trustees of the Village of Rye, New York, at the Municipal Hall of the said Village, at 8 P. M., October 28th, 1908.

Said proposals to cover the furnishing of materials and the performance of labor required for the construction of certain sanitary sewers and of a sewage disposal plant, in accordance with plans and specifications now on file in the charge of the Village Clerk.

Copies of the specifications and plans may be seen also at the office of the engineer, G. Everett Hill, 156 Fifth Avenue, New York City.

Approximately, the proposed work consists of:

About 90,000 feet of vitrified pipe sewers, 8-inch to 18-inch, laid complete, with manholes and flush-tanks, much of it in rock excavation.
About 12,600 feet of iron pipe sewers, siphons and force-main, 4-inch to 16-inch.
About 1,200 feet of subaqueous iron effluent-outlet into Long Island Sound.
An indeterminate amount of agricultural drain-tile laid in sewer trench.
Two small pumping stations complete.
Sewage tanks and coke filter-beds, with appurtenances.
A considerable but indeterminate amount of piling and earthwork.

Each bid must be accompanied by a certified check for Five Thousand Dollars ($5,000) as a guarantee that the bidder, if his bid be accepted, will enter into contract and execute the required bond.

Each bid must be made on blank forms to be obtained from the Village Clerk or the Engineer.

The Village reserves the right to reject any or all bids.

All bids must be enclosed in sealed envelopes, marked "Proposal for the Construction of Sewers and Sewage Disposal Works," and each must be enclosed in a second envelope addressed to

THE BOARD OF VILLAGE TRUSTEES,
Rye, Westchester Co., N. Y.
G. EVERETT HILL, Engineer,
156 Fifth Ave., New York City.

MACADAMIZING.

Westfield, N. J.

Sealed proposals will be received by the Council of the Town of Westfield, at the Town Room, on Monday, October 5th, 1908, at 8.15 p. m., for macadamizing, guttering and constructing culverts on certain streets in said Town, as set forth in Special Ordinances 167 and 180.

The Engineer's approximate estimate of quantities is as follows:

2,000 cu. yds. excavation,
16,000 sq. yds. six (6) inch macadam,
1,000 sq. yds. cobble gutters,
700 sq. yds. Belgian block gutters.
725 lin. ft. culverts.
16,800 sq. yds. of earth roadbed to be regulated.

Each proposal must be accompanied by a certified check for $500.00 drawn to the order of the Treasurer of the Town of Westfield, N. J., as an evidence of good faith and the successful bidder will be required to furnish a bond of $6,000.00, with sureties acceptable to the Council, to guarantee the faithful performance of the contract.

Specifications may be examined and blank forms obtained at the office of A. W. Vars, Town Surveyor, No. 129 Elm Street, Westfield, N. J.

The Council reserves the right to reject any or all bids, to disregard the bids for cobble gutters and culverts or to substitute Belgian block gutters for culverts in awarding the contract, if deemed for the best interests of the Town.

LLOYD THOMPSON,
Town Clerk.

Sept. 21, 1908.

WATER-WORKS.

Syracuse, N. Y.

Sealed proposals for the construction of a water-works system for the Village will be received at the office of the Board of Trustees, Marcellus, N. Y., until 2 P. M., Wednesday, September [illegible].

The principal items are approximately as follows:

500 cu. yds. earth excavation.
40 cu. yds. concrete masonry.
23,600 lin. ft. trenching and laying 4, 6, 8 and 10-inch pipe.
440 tons C.-I. pipe.
31 Hydrants.
18 Stop valves.

A properly certified check for $500.00 must accompany each bid.

A bond of $5,000.00 will be required for the faithful performance of the contract.

Bids will be received for the labor and furnishing of materials, but the right is reserved by the Board of Trustees to enter into contract for labor only, the materials being furnished by the Village.

The right is reserved to reject any or all bids. Plans may be seen and specifications may be obtained of the Village Clerk or of the Engineers.

F. W. KNAPP, Clerk,
Marcellus, N. Y.
MORRISON & FARRINGTON, Inc.,
Engineers, Syracuse, N. Y.

TREASURY DEPARTMENT, Office of the Supervising Architect, Washington, D. C., September 22, 1908.—Sealed proposals will be received at this office until 3 o'clock P. M., on the 30th day of October, 1908, and then opened, for the construction (including plumbing, gas piping, heating apparatus, electric conduits and wiring) of the U. S. Post Office at Carthage, Missouri, in accordance with drawings and specification, copies of which may be obtained from the Custodian of site at Carthage, Mo., after the 5th day of October, or at this office after the 3d day of October, at the discretion of the Supervising Architect. JAMES KNOX TAYLOR, Supervising Architect.

Miscellaneous Wants

WANTED TO RENT
One Steam Shovel, 1½ yds.
One Steam Shovel, 2 yds.
One Spreader Car.
Fifty 4 or 5 yd. standard gage, two way Dump Cars.
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